

Applicant respectfully demands that the anonymous group of individuals, i.e. "Secret Committee," responsible for directing the named Examiner's actions in this case, consider and evaluate in detail this and all other evidence of record so far ignored and, to the extent that it finds fault with any of the scientific data, that those findings be communicated to provide Applicant a full and fair opportunity to respond.

The rejection of claims 17-300 under 35 U.S.C. § 101 as being inoperative and lacking utility is respectfully traversed. Applicant respectfully submits that the Secret Committee has not met its burden of raising a *prima facie* case of inoperability for the many reasons of record and, therefore, the rejection should be withdrawn for those reasons alone. Furthermore, Applicant has disclosed substantial experimental evidence in the present disclosure, prior submissions, and submissions herewith that fully rebut any *prima facie* case of inoperability the Committee might have raised. Applicant responds more fully to the Committee's comments, discusses the experimental evidence of record, and summarizes the improper prosecution procedures used by the Committee in the following paragraphs. For these additional reasons, the Section 101 rejection should be withdrawn.

The related rejection of claims 17-300 under 35 U.S.C. § 112, first paragraph, as lacking enablement, is also respectfully traversed. Applicant respectfully submits that the Committee has not met its burden of raising a *prima facie* case of lack of enablement for the many reasons of record and, therefore, the rejection should be withdrawn for those reasons alone. Furthermore, Applicant has disclosed substantial experimental evidence in the present disclosure, prior submissions, and submissions herewith that fully rebut any *prima facie* case of lack of enablement the Committee might have raised. Applicant responds more fully to the Committee's comments, discusses the experimental evidence of record, and summarizes the improper prosecution procedures used by the Committee in the following paragraphs. For these additional reasons, the Section 112, first paragraph, rejection should be withdrawn.

Applicant also files herewith a Rule 132 Declaration certifying his newly submitted experimental evidence, which further rebuts the Committee's unjustified utility and enablement rejections of the claimed invention. This evidence, which the PTO required Applicant to submit to scientific journals for publication, conclusively confirms

the formation of lower-energy hydrogen through practice of Applicant's novel hydrogen chemistry. To this day, the Committee has failed to properly consider the numerous Rule 132 Declarations previously filed by Applicant in violation of its own rules as outlined in MPEP § 716:

Evidence traversing rejections must be considered by the examiner whenever present. All entered affidavits, declarations, and other evidence traversing rejections are acknowledged and commented upon by the examiner in the next succeeding action. ... Where the evidence is insufficient to overcome the rejection, the examiner must specifically explain why the evidence is insufficient. General statements such "the declaration lacks technical validity" or "the evidence is not commensurate with the scope of the claims" without an explanation supporting such findings are insufficient. [Emphasis added.]

The Committee does not even mention, let alone consider, most of the certified experimental evidence identified in Applicant's Rule 132 Declarations that were submitted to overcome the rejections of record. Consequently, those rejections are fatally defective and should be withdrawn.

With this latest submission, Applicant now has over 100 articles and books of record in this case, as reflected in the "List of References" set forth below.¹ These articles detail studies that experimentally confirm a novel reaction of atomic hydrogen, which produces hydrogen in fractional quantum states that are at lower energies than the traditional "ground" ($n = 1$) state, a chemically generated or assisted plasma (rt-plasma), and novel hydride compounds, including:

extreme ultraviolet (EUV) spectroscopy²,
characteristic emission from catalysis and the hydride ion products³,
lower-energy hydrogen emission⁴,
plasma formation⁵,
Balmer α line broadening⁶,

¹ While the articles and books numbered 1-70 were already made of record in previous submissions, many of those articles have now been published. Therefore, Applicant submits herewith copies of articles 50-101.

² Reference Nos. 11-16, 20, 24, 27-29, 31-36, 39, 42, 43, 46-47, 50-52, 54, 55, 57, 59, 63, 65-68, 70-76, 78, 79, 81, 83, 85, 86, 89, 91-93, 95-96, 98, 101, 104

³ Reference Nos. 24, 27, 32, 39, 42, 46, 51, 52, 55, 57, 68, 72, 73, 81, 89, 91

⁴ Reference Nos. 14, 28, 29, 33-36, 50, 63, 67, 70, 71, 73, 75, 76, 78, 79, 86, 87, 90, 92, 93, 98, 101, 104

⁵ Reference Nos. 11-13, 15, 16, 20, 24, 27, 32, 39, 42, 46, 47, 51, 52, 54, 55, 57, 72, 81, 89, 91-93

⁶ Reference Nos. 16, 20, 30, 33-37, 39, 42, 43, 49, 51, 52, 54, 55, 57, 63-65, 68, 69, 71-74, 81-85, 88, 89, 91-93, 95-97, 105

population inversion of hydrogen lines⁷,
elevated electron temperature⁸,
anomalous plasma afterglow duration⁹,
power generation¹⁰,
excessive light emission¹¹,
analysis of chemical compounds¹², and
direct plasma to electric power conversion¹³

Exemplary studies include:

1.) the observation of intense extreme ultraviolet (EUV) emission at low temperatures (e.g. $\approx 10^3 K$) from atomic hydrogen and only those atomized elements or gaseous ions which provide a net enthalpy of reaction of approximately $m \cdot 27.2 eV$ via the ionization of t electrons to a continuum energy level where t and m are each an integer (e.g. K and Cs atoms and Rb^+ and Sr^+ ions ionize at integer multiples of the potential energy of atomic hydrogen and caused emission; whereas, the chemically similar atoms, Na , Mg , and Ba , do not ionize at integer multiples of the potential energy of atomic hydrogen and caused no emission)¹⁴,

2.) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen with energies of $q \cdot 13.6 eV$ where $q = 1, 2, 3, 4, 6, 7, 8, 9, 11, 12$ or these lines inelastically scattered by helium atoms in the excitation of $He(1s^2)$ to $He(1s^1 2p^1)$ that were identified as hydrogen transitions to electronic energy levels below the "ground" state corresponding to fractional quantum numbers¹⁵,

3.) the observation of novel EUV emission lines from microwave and glow discharges of helium with 2% hydrogen at $44.2 nm$ and $40.5 nm$ with energies of

⁷ Reference Nos. 39, 46, 51, 54, 55, 57, 59, 65, 66, 68, 74, 83, 85, 89, 91

⁸ Reference Nos. 34-37, 43, 49, 63, 67, 73

⁹ Reference Nos. 12, 13, 47, 81

¹⁰ Reference Nos. 30, 31, 33, 35, 36, 39, 43, 50, 63, 71-73, 76, 77, 81, 84, 89, 92, 93, 98

¹¹ Reference Nos. 11, 16, 20, 23, 31, 37, 43, 52, 72

¹² Reference Nos. 6-10, 19, 25, 38, 41, 44, 45, 60-62, 64, 69, 75, 81, 82, 87, 88, 90, 92-94, 98, 100, 101, 104

¹³ Reference Nos. 18, 26, 40, 48, 56, 68

¹⁴ Reference Nos. 11-13, 15, 16, 20, 24, 27, 32, 39, 42, 46, 47, 51, 52, 54, 55, 57, 72, 81, 89, 91-93

¹⁵ Reference Nos. 28, 33-36, 50, 63, 67, 71, 73, 75, 76, 78, 86, 87, 90

$q \cdot 13.6 + \left(\frac{1}{n_f^2} - \frac{1}{n_i^2} \right) \times 13.6 \text{ eV}$ where $q = 2$ and $n_f = 2, 4$ $n_i = \infty$ that corresponded to multipole coupling to give two-photon emission from a continuum excited state atom and an atom undergoing fractional Rydberg state transition¹⁶,

4.) the identification of transitions of atomic hydrogen to lower energy levels corresponding to lower-energy hydrogen atoms in the extreme ultraviolet emission spectrum from interstellar medium and the sun¹⁷,

5.) the observation that the novel EUV series of lines with energies of $q \cdot 13.6 \text{ eV}$ was observed with an Evenson microwave cell, only the peak corresponding to $q = 2$ was observed with an RF cell, and none of the peaks were observed with a glow discharge cell¹⁸,

6.) the observation that in a comparison of Evenson, McCarroll, cylindrical, and Beenakker microwave cavity plasmas, the novel EUV series of lines with energies of $q \cdot 13.6 \text{ eV}$ was only observed for Evenson-cavity helium-hydrogen plasmas¹⁹,

7.) the EUV spectroscopic observation of lines for a hydrogen-*K* catalyst plasma by the Institut für Niedertemperatur-Plasmaphysik e.V. that could be assigned to transitions of atomic hydrogen to lower energy levels corresponding to fractional principal quantum numbers and the emission from the excitation of the corresponding hydride ions²⁰,

8.) the recent analysis of mobility and spectroscopy data of individual electrons in liquid helium which shows direct experimental confirmation that electrons may have fractional principal quantum energy levels²¹,

9.) the observation of novel EUV emission lines from microwave discharges of argon or helium with 10% hydrogen that matched those predicted for the reaction

¹⁶ Reference Nos. 36, 71, 73

¹⁷ Reference Nos. 1, 5, 17, 28, 29

¹⁸ Reference Nos. 71, 73

¹⁹ Reference No. 76

²⁰ Reference No. 14

²¹ Reference Nos. 17, 53

$H(1/4) + H^+ \rightarrow H_2(1/4)^+$ having an energy spacing of 2^2 times the transition-state vibrational energy of H_2^+ with the series ending on the bond energy of $H_2(1/4)^+$ ²²,

10.) the result that the novel vibrational series for the reaction $H(1/4) + H^+ \rightarrow H_2(1/4)^+$ was only observed for catalyst plasmas of helium, neon, and argon mixed with hydrogen, but not with noncatalyst xenon or krypton mixed plasmas²³,

11.) the observation that based on the intensities of the peaks, the catalyst and the plasma source dependence of the reaction rate to form $H_2(1/4)^+$ is $Ar^+ > He^+ > Ne^+$ and microwave > glow discharge >> RF, respectively²⁴,

12.) the observation that the microwave plasma source dependence of the reaction rate to form $H_2(1/4)^+$ is Evenson microwave > McCarroll, cylindrical, Beenakker²⁵,

13.) the observation of rotational lines in the 145-300 nm region from atmospheric pressure 15 keV electron-beam excited argon-hydrogen plasmas where the unprecedented energy spacing of 4^2 times that of hydrogen established the internuclear distance as 1/4 that of H_2 and identified $H_2(1/4)$ ²⁶,

14.) the observation of a series of vibration-rotational bands in the 60-67 nm region, a high-energy region for which vibration-rotational spectra are ordinarily unknown, emitted from low-pressure helium-hydrogen (99/1%) microwave plasmas that matched the predicted energy spacing of the vibrational energy of H_2 about the bond energy of $H_2(1/2)$ corresponding to the reaction $2H(1/2) \rightarrow H_2(1/2)$ ²⁷,

15.) the observation of EUV plasma emission spectra in the region 60 nm to 100 nm that matched the predicted emission lines $E_{D_{H_2}}$ due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\frac{\nu^*}{3}\right) 0.515902 \text{ eV}$ to longer wavelengths for $\nu^* = 2$ to $\nu^* = 32$ and to

²² Reference Nos. 29, 70, 73, 79, 92, 93, 98, 101, 104

²³ Reference Nos. 29, 70, 73, 79, 92, 93, 101

²⁴ Reference No. 70

²⁵ Reference No. 79

²⁶ Reference No. 98, 101, 104

²⁷ Reference No. 99

shorter wavelengths for $\nu^* = 1$ to $\nu^* = 16$ to within the spectrometer resolution of about $\pm 0.05\%$ ²⁸,

16.) the observation that in addition to members of the series of novel emission lines with energies of $q \cdot 13.6 \text{ eV}$ or $E_{D+vib} = 17.913 \pm \left(\frac{\nu^*}{3}\right) 0.515902 \text{ eV}$ an additional intense peak was observed from a scaled-up Evenson cell at 41.6 nm with an energy of 29.81 eV that matched $q \cdot 13.6 \text{ eV}$ with $q = 4$ less 24.58741 eV corresponding to inelastic scattering of these photons by helium atoms due to ionization of He to He^+ ²⁹,

17.) the observation that in a comparison of Evenson, McCarroll, cylindrical, and Beenakker microwave cavity plasmas, the novel series of spectral lines due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\frac{\nu^*}{3}\right) 0.515902 \text{ eV}$ was only observed for Evenson-cavity helium-hydrogen and neon-hydrogen plasmas³⁰,

18.) the observation by gas chromatography that hydrogen was consumed by the helium-hydrogen plasmas which showed the novel EUV series of lines with energies of $q \cdot 13.6 \text{ eV}$, the novel series of spectral lines due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at energies of $E_{D+vib} = 17.913 \pm \left(\frac{\nu^*}{3}\right) 0.515902 \text{ eV}$, extraordinary H Balmer line broadening corresponding to $180\text{-}210 \text{ eV}$, and excess power of 21.9 W in 3 cm ³¹,

19.) the observation of the dominant He^+ emission and an intensification of the plasma emission observed when He^+ was present with atomic hydrogen demonstrated the role of He^+ as a catalyst³²,

20.) the observation of continuum state emission of Cs^{2+} and Ar^{2+} at 53.3 nm and 45.6 nm , respectively, with the absence of the other corresponding Rydberg series

²⁸ Reference Nos. 50, 75, 76, 78, 86, 87, 90

²⁹ Reference No. 86

³⁰ Reference No. 76

³¹ Reference No. 76

³² Reference Nos. 36, 73

of lines from these species which confirmed the resonant nonradiative energy transfer of 27.2 eV from atomic hydrogen to the either Cs or Ar^+ catalyst³³,

21.) the spectroscopic observation of the predicted hydride ion $H^-(1/2)$ of hydrogen catalysis by either Cs or Ar^+ catalyst at 407 nm corresponding to its predicted binding energy of 3.05 eV ³⁴,

22.) the observation of characteristic emission from K^{3+} which confirmed the resonant nonradiative energy transfer of $3 \cdot 27.2\text{ eV}$ from atomic hydrogen to atomic K ³⁵,

23.) the spectroscopic observation of the predicted $H^-(1/4)$ ion of hydrogen catalysis by K catalyst at 110 nm corresponding to its predicted binding energy of 11.2 eV ³⁶,

24.) the observation of characteristic emission from Rb^{2+} which confirmed the resonant nonradiative energy transfer of 27.2 eV from atomic hydrogen to Rb^+ ³⁷,

25.) the spectroscopic observation of the predicted $H^-(1/2)$ ion of hydrogen catalysis by Rb^+ catalyst at 407 nm corresponding to its predicted binding energy of 3.05 eV ³⁸,

26.) the observation of $H^-(1/2)$, the hydride ion catalyst product of K^+ / K^+ or Rb^+ , at its predicted binding energy of 3.0468 eV by high resolution visible spectroscopy as a continuum threshold at 4068.2 \AA and a series of structured peaks separated from the binding energy by an integer multiple of the fine structure of $H(1/2)$ starting at 4071 \AA that matched predicted free-free transitions³⁹,

27.) the observation that the high resolution visible K^+ / K^+ or $Rb^+ - H_2$ plasma emission spectra in the region of 3995 to 4060 \AA matched the predicted bound-free

³³ Reference Nos. 24, 39, 51, 54, 55, 57, 91

³⁴ Reference No. 24

³⁵ Reference Nos. 27, 39, 42, 46, 51, 54, 55, 57, 81, 89, 91

³⁶ Reference Nos. 27, 42, 81

³⁷ Reference Nos. 32, 39, 42, 46, 51, 54, 55, 57, 81, 89, 91

³⁸ Reference No. 32

³⁹ Reference Nos. 39, 42, 46, 57, 81, 89, 91

hyperfine structure lines E_{HF} of $H^-(1/2)$ calculated from the electron g factor as $E_{HF} = j^2 3.00213 \times 10^{-5} + 3.0563 \text{ eV}$ (j is an integer) for $j = 1$ to $j = 39$ (3.0563 eV to 3.1012 eV—the hydride binding energy peak plus one and five times the spin-pairing energy, respectively) to within a 1 part per 10^{440} ,

28.) Rb^+ or $2K^+$ catalysts formed a plasma having strong VUV emission with a stationary inverted Lyman population with an overpopulation sufficient for lasing, and emission from $H^-(1/2)$ was observed at 4071 Å corresponding to its predicted binding energy of 3.0468 eV with the fine structure and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213 \times 10^{-5} + 3.0563 \text{ eV}$ (j is an integer) that matched for $j = 1$ to $j = 37$ to within a 1 part per 10^{441} ,

29.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing at wavelengths over a wide range from micron to blue wherein molecular oxygen served as the catalyst as supported by O^{2+} emission and H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone⁴²,

30.) the observation of H Balmer line broadening of 55 eV compared to 1 eV for hydrogen alone at distances up to 5 cm from the coupler⁴³,

31.) the observation that with a microwave input power of $9 \text{ W} \cdot \text{cm}^{-3}$, a collisional radiative model showed that the hydrogen excited state population distribution was consistent with an $n = 1 \rightarrow 5,6$ pumping power of an unprecedented $200 \text{ W} \cdot \text{cm}^{-3}$ permissive of gas laser efficiencies orders of magnitude those of conventional visible gas lasers and direct generation of electrical power using photovoltaic conversion of the spontaneous or stimulated water vapor plasma emission⁴⁴;

32.) the observation of stimulation of the stationary inverted H Balmer population from a low pressure water-vapor microwave discharge plasma by back illumination with an infrared source that showed depopulation of the $n = 5$ state⁴⁵,

⁴⁰ Reference Nos. 39, 42, 46, 57, 81, 89, 91

⁴¹ Reference Nos. 39, 42, 46, 51, 54, 55, 57, 81, 89, 91

⁴² Reference Nos. 59, 65, 66, 68, 74, 83, 85

⁴³ Reference No. 74

⁴⁴ Reference Nos. 68, 83, 85

⁴⁵ Reference Nos. 59, 65, 68, 85

33.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing was observed for Evenson microwave plasmas, but not for RF or discharge plasmas⁴⁶,

34.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing that was dependent on the microwave plasma source with the highest inversion from Evenson microwave plasmas⁴⁷,

35.) the observation of stationary inverted H Balmer and Lyman populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing that was dependent on the pressure of the Evenson microwave plasma⁴⁸,

36.) the observation of stationary inverted H Balmer populations from a low pressure water-vapor microwave discharge plasma with an overpopulation sufficient for lasing at distances up to 5 cm from the coupler⁴⁹,

37.) the observation that the requirement for the natural hydrogen-oxygen stoichiometry of the Evenson water plasma was stringent in that a deviation by over 2% excess of either gas caused a reversal of the H inversion in water vapor plasmas⁵⁰,

38.) the observation of a typical slow H population for a water-vapor plasma maintained in a GEC-type cell that was independent of time, and a new phenomenon, an extraordinary fast population that increased from zero to a significant portion of the Balmer α emission with time under no-flow conditions wherein the peak width and energy increased with time up to a 0.7 nm half-width corresponding to an average hydrogen atom energy of 200 eV⁵¹,

⁴⁶ Reference Nos. 59, 65, 66, 68, 73, 83, 85

⁴⁷ Reference No. 83

⁴⁸ Reference Nos. 59, 68, 73, 83, 85

⁴⁹ Reference No. 74

⁵⁰ Reference Nos. 59, 68, 83, 85

⁵¹ Reference No. 95

39.) the observation of a substantial fast H population (~20% at 40 eV) for a water-vapor plasmas maintained in a GEC-type cell that was independent of position including regions where the electric field was orders of magnitude too low to explain the extraordinarily high Doppler energies⁵²,

40.) the observation of fast H population (40-50 eV) for a He/H_2 (95/5%), Ar/H_2 (95/5%), and H_2 plasmas maintained in a GEC-type cell that was independent of position including regions where the electric field was orders of magnitude too low to explain the extraordinarily high Doppler energies⁵³,

41.) the observation by the Institut für Niedertemperatur-Plasmaphysik e.V. of an anomalous plasma and plasma afterglow duration formed with hydrogen-potassium mixtures⁵⁴,

42.) the observation of anomalous afterglow durations of plasmas formed by catalysts providing a net enthalpy of reaction within thermal energies of $m \cdot 27.28 \text{ eV}$ ⁵⁵,

43.) the formation of a chemically generated hydrogen plasma with the observation of Lyman series in the EUV that represents an energy release about 10 times that of hydrogen combustion which is greater than that of any possible known chemical reaction⁵⁶,

44.) the observation of line emission by the Institut für Niedertemperatur-Plasmaphysik e.V. with a 4° grazing incidence EUV spectrometer that was 100 times more energetic than the combustion of hydrogen⁵⁷,

45.) the excessive increase in the Lyman emission upon the addition of helium or argon catalyst to a hydrogen plasma⁵⁸,

⁵² Reference No. 96

⁵³ Reference Nos. 92, 93, 97, 105

⁵⁴ Reference Nos. 13, 47, 81

⁵⁵ Reference Nos. 12, 13, 47, 81

⁵⁶ Reference Nos. 11-13, 15, 16, 20, 24, 27, 32, 39, 42, 46, 47, 51, 52, 54, 55, 57, 72, 81, 89, 91

⁵⁷ Reference No. 14

⁵⁸ Reference Nos. 20, 31, 37, 43

46.) the observation of the characteristic emission from Sr^+ and Sr^{3+} that confirmed the resonant nonradiative energy transfer of $2 \cdot 27.2 \text{ eV}$ from atomic hydrogen to Sr^{+59} ,

47.) the observation of anomalous plasmas formed with Sr and Ar^+ catalysts at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source⁶⁰,

48.) the observation that the optically measured output power of gas cells for power supplied to the glow discharge increased by over two orders of magnitude depending on the presence of less than 1% partial pressure of certain catalysts in hydrogen gas or argon-hydrogen gas mixtures, and an excess thermal balance of 42 W was measured for the 97% argon and 3% hydrogen mixture versus argon plasma alone⁶¹,

49.) the observation that glow discharge plasmas of the catalyst-hydrogen mixtures of strontium-hydrogen, helium-hydrogen, argon-hydrogen, strontium-helium-hydrogen, and strontium-argon-hydrogen showed significant Balmer α line broadening corresponding to an average hydrogen atom temperature of $25 - 45 \text{ eV}$; whereas, plasmas of the noncatalyst-hydrogen mixtures of pure hydrogen, krypton-hydrogen, xenon-hydrogen, and magnesium-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of $\approx 3 \text{ eV}$ ⁶²,

50.) the observation that microwave helium-hydrogen and argon-hydrogen plasmas having catalyst Ar^+ or He^+ showed extraordinary Balmer α line broadening due to hydrogen catalysis corresponding to an average hydrogen atom temperature of $110 - 130 \text{ eV}$ and $180 - 210 \text{ eV}$, respectively; whereas, plasmas of pure hydrogen, neon-hydrogen, krypton-hydrogen, and xenon-hydrogen showed no excessive broadening corresponding to an average hydrogen atom temperature of $\approx 3 \text{ eV}$ ⁶³,

⁵⁹ Reference Nos. 16, 52

⁶⁰ Reference Nos. 11, 16, 20, 23, 52, 72

⁶¹ Reference No. 22

⁶² Reference Nos. 16, 20, 30, 52, 72

⁶³ Reference Nos. 33-37, 43, 49, 60, 63, 64, 69, 71, 73, 74, 82, 84, 88

51.) the observation that microwave helium-hydrogen and argon-hydrogen plasmas showed average electron temperatures that were high, $30,500 \pm 5\% K$ and $13,700 \pm 5\% K$, respectively; whereas, the corresponding temperatures of helium and argon alone were only $7400 \pm 5\% K$ and $5700 \pm 5\% K$, respectively⁶⁴,

52.) the observation of significant Balmer α line broadening of 17, 9, 11, 14, and 24 eV from rt-plasmas of incandescently heated hydrogen with K^+ / K^+ , Rb^+ , cesium, strontium, and strontium with Ar^+ catalysts, respectively, wherein the results could not be explained by Stark or thermal broadening or electric field acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm, corresponding to a broadening of much less than 1 eV⁶⁵,

53.) calorimetric measurement of excess power of 20 mW/cc on rt-plasmas formed by heating hydrogen with K^+ / K^+ and Ar^+ as catalysts⁶⁶,

54.) the observation of rt-plasmas formed with strontium and argon at 1% of the theoretical or prior known voltage requirement with a light output per unit power input up to 8600 times that of the control standard light source as well as an excess power of 20 mW/cm from rt-plasmas formed by Ar^+ as the catalyst in an incandescent-filament cell⁶⁷,

55.) the Calvet calorimetry measurement of an energy balance of over $-151,000 kJ/mole H_2$ with the addition of 3% hydrogen to a plasma of argon having the catalyst Ar^+ compared to the enthalpy of combustion of hydrogen of $-241.8 kJ/mole H_2$; whereas, under identical conditions no change in the Calvet voltage was observed when hydrogen was added to a plasma of noncatalyst xenon⁶⁸,

56.) the observation that the power output exceeded the power supplied to hydrogen glow discharge plasmas by 35-184 W depending on the presence of catalysts from helium or argon and less than 1% partial pressure of strontium metal in noble gas-

⁶⁴ Reference Nos. 34-37, 43, 49, 63, 67, 73

⁶⁵ Reference Nos. 39, 42, 46, 51, 52, 54, 55, 57, 72, 81, 89, 91

⁶⁶ Reference Nos. 39, 81, 89

⁶⁷ Reference No. 72

⁶⁸ Reference No. 31

hydrogen mixtures; whereas, the chemically similar noncatalyst krypton had no effect on the power balance⁶⁹,

57.) the observation that with the addition of 3% flowing hydrogen to an argon microwave plasma with a constant input power of 40 W , the gas temperature increased from 400°C to over 750°C; whereas, the 400°C temperature of a xenon plasma run under identical conditions was essentially unchanged with the addition of hydrogen⁷⁰,

58.) observations of power such as that where the addition of 10% hydrogen to a helium microwave plasma maintained with a constant microwave input power of 40 W , the thermal output power was measured to be at least 280 W corresponding to a reactor temperature rise from room temperature to 1200°C within 150 seconds, a power density of 28 MW/m^3 , and an energy balance of at least $-4 \times 10^5 \text{ kJ/mole } H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$ ⁷¹,

59.) the observation of $306 \pm 5 \text{ W}$ of excess power generated in 45 cm^3 by a compound-hollow-cathode-glow discharge of a neon-hydrogen (99.5/0.5%) mixture corresponding to a power density of 6.8 MW/m^3 and an energy balance of at least $-1 \times 10^6 \text{ kJ/mole } H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$ ⁷²,

60.) the observation that for an input of 37.7 W, the total plasma power of the neon-hydrogen plasma measured by water bath calorimetry was 60.7 W corresponding to 23.0 W of excess power in 3 cm^3 ⁷³,

61.) the observation of intense He^+ emission and a total plasma power of a helium-hydrogen plasma measured by water bath calorimetry of 30.0 W for an input of 8.1 W, corresponding to 21.9 W of excess power in 3 cm^3 wherein the excess power density and energy balance were high, 7.3 W/cm^3 and $-2.9 \times 10^4 \text{ kJ/mole } H_2$, respectively⁷⁴,

⁶⁹ Reference No. 30

⁷⁰ Reference No. 43

⁷¹ Reference Nos. 34, 35

⁷² Reference Nos. 50, 78

⁷³ Reference No. 76

⁷⁴ Reference Nos. 36, 63, 71, 73

62.) in the comparison of helium-hydrogen plasmas sources, the observation that i.) with an input power of 24.8 ± 1 W, the total plasma power of the Evenson microwave helium-hydrogen plasma measured by water bath calorimetry was 49.1 ± 1 W corresponding to 24.3 ± 1 W of excess power in 3 cm^3 corresponding to a high excess power density and energy balance of 8.1 W/cm^3 and over $-3 \times 10^4 \text{ kJ/mole H}_2$, respectively, ii.) with an input of 500 W, a total power of 623 W was generated in a 45 cm^3 compound-hollow-cathode-glow discharge, iii.) less than 10% excess power was observed from inductively coupled RF helium-hydrogen plasmas, and iv.) no measurable heat was observed from MKS/Astex microwave helium-hydrogen plasmas that corresponded to the absence of H Balmer line broadening⁷⁵,

63.) the observation of energy balances of helium-hydrogen microwave plasmas of over 100 times the combustion of hydrogen and power densities greater than 10 W/cm^3 measured by water bath calorimetry⁷⁶,

64.) at the load matching condition of 600Ω , the direct plasmadynamic conversion (PDC) of open circuit voltages of 11.5 V and ~200 mW of electrical power with a 0.125 in diameter by 3/4 in long plasmadynamic electrode and a 140 G applied field corresponding to an extracted power density of $\sim 1.61 \text{ W/cm}^3$ and an efficiency of $\sim 18.8\%$ ⁷⁷,

65.) at the load matching condition of 250Ω , the direct plasmadynamic conversion (PDC) of open circuit voltages of 21.8 V and 1.87 W of electrical power with a 0.125 in diameter by 3/4 in long plasmadynamic electrode and a 140 G applied field corresponding to an extracted power density of 3.6 W/cm^3 and an efficiency of 42% ⁷⁸,

66.) the projection that the generation of electricity using magnetohydrodynamic (MHD) conversion of the plasma particle energy of small to mid-size chemically assisted microwave or glow discharge plasma (ca-plasma) power sources in the range of a few hundred Watts to several 10's of kW for microdistributed commercial applications appears feasible at 50% efficiency or better with a simple compact design⁷⁹,

⁷⁵ Reference Nos. 84, 98, 104

⁷⁶ Reference Nos. 34-36, 50, 63, 71, 73, 76-78, 84, 92, 93, 101

⁷⁷ Reference No. 48

⁷⁸ Reference No. 56

⁷⁹ Reference No. 40

67.) the differential scanning calorimetry (DSC) measurement of minimum heats of formation of KHI by the catalytic reaction of K with atomic hydrogen and KI that were over $-2000 \text{ kJ/mole } H_2$ compared to the enthalpy of combustion of hydrogen of $-241.8 \text{ kJ/mole } H_2$ ⁸⁰,

68.) the isolation of novel hydrogen compounds as products of the reaction of atomic hydrogen with atoms and ions which formed an anomalous plasma as reported in the EUV studies⁸¹,

69.) the synthesis and identification of a novel diamond-like carbon film terminated with $CH(1/p)$ ($H^+ \text{ DLC}$) comprising high binding energy hydride ions was synthesized for the first time from solid carbon by a microwave plasma reaction of a mixture of 10-30% hydrogen and 90-70% helium wherein He^+ served as a catalyst with atomic hydrogen to form the highly stable hydride ions and an energetic plasma⁸²,

70.) the synthesis of polycrystalline diamond films on silicon substrates without diamond seeding by a very low power microwave plasma reaction of a mixture of helium-hydrogen-methane (48.2/48.2/3.6%) wherein He^+ served as a catalyst with atomic hydrogen to form an energetic plasma with an average hydrogen atom temperature of 180-210 eV versus $\approx 3 \text{ eV}$ for pure hydrogen and bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond⁸³,

71.) the synthesis of polycrystalline diamond films on silicon substrates without diamond seeding by a very low power microwave plasma reaction of a mixture of argon-hydrogen-methane (17.5/80/2.5%) wherein Ar^+ served as a catalyst with atomic hydrogen to form an energetic plasma with an average hydrogen atom temperature of 110-130 eV versus $\approx 3 \text{ eV}$ for pure hydrogen and bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond⁸⁴,

⁸⁰ Reference No. 25

⁸¹ Reference Nos. 6-10, 19, 25, 38, 41, 44, 45, 60-62, 75, 81, 87, 90, 92, 93, 100, 101

⁸² Reference No. 60

⁸³ Reference Nos. 64, 69, 88

⁸⁴ Reference Nos. 82, 88

72.) the identification of a novel highly stable surface coating $SiH(1/p)$ by time of flight secondary ion mass spectroscopy that showed SiH^+ in the positive spectrum and H^- dominant in the negative spectrum and by X-ray photoelectron spectroscopy which showed that the H content of the SiH coatings was hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively, and showed that the surface was remarkably stable to air⁸⁵,

73.) the isolation of novel inorganic hydride compounds such as $KHKHCO_3$ and KH following each of the electrolysis and plasma electrolysis of a K_2CO_3 electrolyte which comprised high binding energy hydride ions that were stable in water with their identification by methods such as (i) ToF-SIMS on $KHKHCO_3$ which showed inorganic hydride clusters $K[KHKHCO_3]^+$ and a negative ToF-SIMS dominated by hydride ion, (ii) X-ray photoelectron spectroscopy which showed novel peaks corresponding to high binding energy hydride ions, and (iii) 1H nuclear magnetic resonance spectroscopy which showed upfield shifted peaks corresponding to more diamagnetic, high-binding-energy hydride ions⁸⁶,

74.) the identification of $LiHCl$ comprising a high binding energy hydride ion by time of flight secondary ion mass spectroscopy which showed a dominant H^- in the negative ion spectrum, X-ray photoelectron spectroscopy which showed $H^-(1/4)$ as a new peak at its predicted binding energy of 11 eV, 1H nuclear magnetic resonance spectroscopy which showed an extraordinary upfield shifted peak of -15.4 ppm corresponding to the novel hydride ion, and powder X-ray diffraction which showed novel peaks⁸⁷,

75.) the identification of novel hydride compounds by a number of analytical methods such as (i) time of flight secondary ion mass spectroscopy which showed a dominant hydride ion in the negative ion spectrum, (ii) X-ray photoelectron spectroscopy which showed novel hydride peaks and significant shifts of the core levels of the primary elements bound to the novel hydride ions, (iii) 1H nuclear magnetic resonance spectroscopy (NMR) which showed extraordinary upfield chemical shifts compared to

⁸⁵ Reference Nos. 45, 61, 100

⁸⁶ Reference Nos. 6-7, 9, 38, 41

⁸⁷ Reference Nos. 44, 62

the NMR of the corresponding ordinary hydrides, and (iv) thermal decomposition with analysis by gas chromatography, and mass spectroscopy which identified the compounds as hydrides⁸⁸,

76.) the NMR identification of novel hydride compounds MH^*X wherein M is the alkali or alkaline earth metal, X , is a halide, and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance⁸⁹,

77.) the replication of the NMR results of the identification of novel hydride compounds by large distinct upfield resonances at Spectral Data Services, University of Massachusetts Amherst, University of Delaware, Grace Davison, and National Research Council of Canada⁹⁰,

78.) the NMR identification of novel hydride compounds MH^* and MH_2^* wherein M is the alkali or alkaline earth metal and H^* comprises a novel high binding energy hydride ion identified by a large distinct upfield resonance that proves the hydride ion is different from the hydride ion of the corresponding known compound of the same composition⁹¹,

79.) the observation that the 1H MAS NMR spectrum of novel compound KH^*Cl relative to external tetramethylsilane (TMS) showed a large distinct upfield resonance at -4.4 corresponding to an absolute resonance shift of -35.9 ppm that matched the theoretical prediction of $p = 4$, and the novel peak of KH^*I at -1.5 ppm relative to TMS corresponding to an absolute resonance shift of -33.0 ppm matched the theoretical prediction of $p = 2$ ⁹²,

80.) the observation that the predicted catalyst reactions, position of the upfield-shifted NMR peaks, and spectroscopic data for $H^-(1/2)$ and $H^-(1/4)$ were found to be in agreement⁹³,

⁸⁸ Reference Nos. 6-10, 19, 25, 38, 41, 44, 45, 60-62, 75, 81, 87, 90, 92, 93, 100

⁸⁹ Reference Nos. 10, 19, 41, 44, 62, 81

⁹⁰ Reference Nos. 19, 81

⁹¹ Reference Nos. 19, 81

⁹² Reference No. 81

⁹³ Reference No. 81

81.) the isolation of fraction-principal-quantum-level molecular hydrogen $H_2(1/p)$ gas by liquefaction using an ultrahigh-vacuum, liquid nitrogen cryotrap, and the observations of novel peaks by cryogenic gas chromatography, a higher ionization energy than H_2 by mass spectroscopy, a substantial change in the EUV emission spectrum with deuterium substitution in a region where no hydrogen emission has ever been observed, and upfield shifted NMR peaks at 0.21, 2.18 and 3.47 ppm compared to that of H_2 at 4.63 ppm⁹⁴,

82.) the observation of 1H NMR singlet peaks upfield of H_2 with a predicted integer spacing of 0.64 ppm at 3.47, 3.02, 2.18, 1.25, 0.85, and 0.22 ppm identified as the consecutive series $H_2(1/2)$, $H_2(1/3)$, $H_2(1/4)$, $H_2(1/5)$, $H_2(1/6)$, and $H_2(1/7)$, respectively, and $H_2(1/10)$ at -1.8 ppm wherein $H_2(1/p)$ gas was isolated by liquefaction at liquid nitrogen temperature, by decomposition of compounds found to contain the corresponding hydride ions $H^-(1/p)$, and by permeation through a hollow nickel cathode⁹⁵.

83.) the observation of excess enthalpy from a K_2CO_3 electrolytic cell of a factor of two times that of the resistive power dissipation and 1H NMR singlet peaks upfield of H_2 with a predicted integer spacing of 0.64 ppm at 3.49, 2.17, 1.25, 0.86, and 0.21 ppm which matched the consecutive series $H_2(1/2)$, $H_2(1/4)$, $H_2(1/5)$, $H_2(1/6)$, and $H_2(1/7)$, respectively, and a higher ionizing molecular hydrogen recorded on the electrolysis gases collected in a hollow nickel cathode⁹⁶.

Applicant again respectfully demands that the Secret Committee consider and evaluate in detail all of this record evidence, which, to date, it has largely ignored. The scientific data disclosed in this extensive body of evidence was collected and peer-reviewed with great care by a group of highly qualified scientists capable of understanding every detail of Applicant's technology. The very least the Committee can do is to also carefully evaluate that data in detail, article by article, with an open mind, so that Applicant is given a full and fair opportunity to present his case. If and when the Committee finally does so, Applicant believes it will find that the evidence

⁹⁴ Reference Nos. 75, 87, 90, 92, 93, 94, 101

⁹⁵ Reference Nos. 98, 101, 103, 104

⁹⁶ Reference Nos. 103, 104

overwhelmingly proves the existence of lower-energy hydrogen in accordance with his claimed invention.

If, on the other hand, the Committee should find true fault with any of that data on legitimate scientific grounds—not the kind of nitpicking Applicant has seen on theoretical grounds—it should communicate as much to afford Applicant the opportunity to respond. Such scientific give-and-take is the only way to advance the prosecution of this case.

Unfortunately, with continued prosecution of this and BlackLight's other applications, a far different pattern has emerged. The Committee continues to set arbitrary and capricious hurdles designed to avoid considering Applicant's conclusive experimental evidence and thereby block his patents from issuing. Each time Applicant clears one of these hurdles, the Committee merely raises the bar by setting new standards.

For instance, the Committee initially alleged that Applicant's disclosed hydrogen chemistry, which forms lower-energy hydrogen, related to the controversial concepts of "perpetual motion" and "cold fusion." When Applicant exposed those allegations as utter nonsense, the Committee quickly abandoned its indefensible position, arguing instead that BlackLight's lower-energy hydrogen technology violated unidentified laws of physics. Then, to cover up its failure to identify even a single physical law that was supposedly being violated, the Committee improperly placed the burden on Applicant to do so: "in order to establish enablement, applicant bears the burden of providing the accepted scientific laws wrong or incomplete." When Applicant showed just the opposite is true—that Applicant's novel hydrogen chemistry complies with all physical laws, even at atomic and sub-atomic levels—the Committee once again backpedaled and changed its position. The Committee then advanced vague assertions that Applicant's lower-energy hydrogen violated "ideas" of modern science and, later, that his technology contradicted "beliefs" in the scientific community.

The only consistency found throughout this myriad of contrived standards is the Committee's use of each to excuse it from fairly considering and evaluating Applicant's scientific evidence that lower-energy hydrogen does indeed exist. Instead, the Committee prefers engaging in a theoretical debate to the exclusion of that evidence,

pitting its favored quantum theory, with all of its far-fetched and disproved predictions, against Applicant's theory of classical quantum mechanics that correctly predicts the formation of lower-energy hydrogen.

Applicant has willingly engaged the Committee in this debate, and will continue to do so if necessary, even though the patent laws do not require that an inventor understand the precise theoretical basis for why his invention works. All the law requires is that he disclose his invention in sufficient detail to enable one of ordinary skill in the art how to practice it. Applicant has done precisely that and the Committee has failed in its burden to show otherwise.

Of course, the debate over these competing theories can go on indefinitely without resolution, which may be the Committee's strategy. Engaging in that intellectual exercise, however, will not—indeed cannot—definitively settle the question of whether practicing Applicant's disclosed hydrogen chemistry results in the formation of lower-energy hydrogen. Like any good theoretical debate, this one can only be tested and ultimately settled by fairly analyzing the unprecedented amount of experimental evidence Applicant has submitted conclusively confirming the lower energy states of hydrogen.

Applicant has expended tens of millions of dollars amassing this experimental evidence. The least the Committee can do is properly consider it. The Committee's view, however, appears to be that, because the existence of lower-energy hydrogen is theoretically impossible—at least according to its misguided view of quantum mechanics—it need not seriously analyze any contrary evidence. Applicant is hard pressed to imagine an approach to patent examination any more arbitrary and capricious than that.

In the few isolated instances in which the Secret Committee does address Applicant's evidence, it comes up with far-fetched reasons for dismissing it without a fair hearing, again demonstrating its arbitrary and capricious approach to examination of this case. One prominent example occurred during the February 21, 2001 Interview of this and other BlackLight applications, which was led by Examiner Vasudevan Jagannathan—one of the few Committee members Applicant has been able to successfully identify. At that interview, Applicant had a brief opportunity to present

some of his scientific evidence, including spectroscopic data that is extraordinarily reliable in analyzing chemical compositions. Such data amounts to a “chemical fingerprint” that cannot be seriously disputed. Despite the conclusiveness of that evidence, Examiner Jagannathan dismissed it out of hand as nothing more than “a bunch of squiggly lines.”

To put the absurdity of that comment in context, the PTO rationalized its withdrawal of BlackLight’s allowed patent applications, in part, by citing a January 12, 2000 article written by Dr. Robert Park, spokesman for one of Applicant’s main competitors, the American Physical Society (APS). [March 22, 2000 Decision at page 7 (Attachment G)] In that article, Dr. Park made the following startling statement:

The energy states of atoms are studied through their atomic spectra—light emitted at very specific wavelengths when electrons make a jump from one energy level to another. The exact prediction of the hydrogen spectrum was one of the first great triumphs of quantum theory; it is the platform on which our entire understanding of atomic physics is built. The theory accounts perfectly for every spectral line.

There is no line corresponding to a “hydrino” state. Indeed there is no credible evidence at all to support Mills’ claim. [See Attachment J]

The incredible irony here—one that cannot be easily overlooked—highlights once again the extreme arbitrary and capricious approach the Committee has taken in examining this and other BlackLight applications. There is no question that the vitriol espoused by Dr. Park in his cited *Post* article was, at least, partially responsible for the PTO’s suspect withdrawal of five allowed BlackLight applications from issue. And yet, despite the fact that the very article the PTO relies upon to deny Applicant his patents recognizes that spectroscopic data is extraordinarily reliable—indeed, the “platform on which our entire understanding of atomic physics is built”—the Committee nonetheless continues to cavalierly ignore or dismiss that same data when submitted by Applicant.

Out of exasperation, Applicant queried Examiner Jagannathan during the February 21 Interview as to what type and quality of evidence would convince him that lower-energy hydrogen exists. In response, the Examiner required that Applicant publish his experimental evidence in peer-reviewed scientific journals for that evidence to be considered reliable. As detailed above, Applicant has more than met this newly

created "publication" standard for considering experimental evidence by submitting over 100 scientific papers for publication. So far, over 50 of these papers have completed and passed the peer-review process conducted by highly qualified Ph.D. referees.

The esteemed list of journals to which Applicant's experimental evidence has been extensively peer-reviewed and published includes:

- Applied Physics Letters
- Chemistry of Materials
- Electrochimica Acta
- Fusion Technology
- IEEE Transactions on Plasma Science
- International Journal of Hydrogen Energy
- Journal of Applied Physics
- Journal of Molecular Structure
- Journal of Plasma Physics
- Journal of Quantitative Spectroscopy and Radiative Transfer,
- Journal of Physics D: Applied Physics
- Journal of New Materials for Electrochemical Systems
- New Journal of Physics
- Plasma Sources Science and Technology
- Solar Energy Materials & Solar Cells
- Thermochimica Acta
- Vibrational Spectroscopy

The esteemed list of journals to which Applicant's experimental evidence has been submitted for publication includes:

- Acta Physica Polonica A
- AIAA Journal
- Annales De La Foundation Louis DeBroglie
- Brazilian Journal of Physics
- Canadian Journal of Physics
- Central European Journal of Physics
- Contributions to Plasma Physics
- Current Applied Physics

Doklady Chemistry
European Journal of Physics D
European Physical Journal: Applied Physics
Europhysics Letters
Foundations of Physics
Frizika A
International Journal of Theoretical Physics
Journal of Applied Physics
Journal of Applied Spectroscopy
Journal of Electroanalytical Chemistry
Journal of Material Science
Journal of the Physical Society of Japan
Journal of Physical Chemistry A
Journal of Physical Chemistry B
Journal of Plasma Physics
Journal of Quantitative Spectroscopy and Radiative Transfer
Journal of Vacuum Science & Technology A
Materials Characterization
Materials Chemistry and Physics
Materials Science
New Journal of Chemistry
Physica B
Physics Essays
Physics of Plasmas
Spectrochimica Acta Part B: Atomic Spectroscopy
Technical Physics
Thin Solid Films
Vacuum

Once again, however, the Secret Committee has raised the bar to patentability by arbitrarily and capriciously ignoring this vast body of evidence, apparently believing that its anonymous Committee members are better qualified than the numerous skilled PhD's who peer-reviewed and approved Applicant's articles confirming the existence of lower-energy hydrogen.

The PTO's mishandling of the experimental evidence of record in this case is but one of several improper actions that have adversely effected Applicant's patent rights.

Others include:

- (1) illegally withdrawing or threatening to withdraw other copending BlackLight patent applications from issue, after initially allowing all claims, under highly suspicious circumstances that suggest possible interference by BlackLight's competitors;
- (2) improperly examining this application by Secret Committee, effectively denying Applicant the right to confront the persons involved in that examination and access their qualifications, and to ascertain whether those persons include BlackLight's competitors, or other improper outside influences, in breach of PTO confidentiality requirements; and
- (3) refusing reasonable requests by Applicant and five U.S. Senators to divulge information relating to the events that triggered the PTO's withdrawal action, and the identity of all PTO employees and non-PTO personnel involved in examining BlackLight's applications.

These improper actions bear directly upon the prosecution of BlackLight's pending applications, yet Applicant's good faith efforts to discuss and resolve these and other outstanding issues have been either ignored or rejected out of hand. One of Applicant's overtures was communicated directly to then PTO Director James E. Rogan in a letter dated December 21, 2001, from BlackLight board member Dr. Shelby T. Brewer. Dr. Brewer received his Ph.D. in Nuclear Engineering from M.I.T. and served as Assistant Energy Secretary in the Reagan administration. [See Attachment A]

As stated in his letter, Dr. Brewer's reasons for appealing to Director Rogan were motivated not only by his fiduciary duty to protect BlackLight's best interests, but also by a sincere desire to avoid unnecessary embarrassment to the PTO over these lingering issues if left unresolved. Dr. Brewer appealed for a meeting with Director Rogan in an attempt to bring some closure to this matter in a way that might mutually benefit both sides.

Despite the urgency of his plea, Dr. Brewer waited over four months before finally receiving a response to his request for a meeting. In a curt letter dated April 24, 2002, from the Director's Chief-of-Staff, Jason C. Roe, the PTO advised: "We appreciate your interest in this matter, but, unfortunately, must decline your request for a meeting due to

the fact that the USPTO is not in a position to discuss the issue at the present time.”
[See Attachment A]

This negative response, while disappointing, was hardly surprising. In refusing to meet with Applicant, the PTO continues to treat prosecution of this and BlackLight’s other copending cases as an adversarial proceeding. While the PTO may believe it is justified in shrouding its untoward actions under a cloak of secrecy and remaining answerable to no one, that approach does little to preserve public confidence in the patent process. Only by openly engaging Applicant in mutually beneficial discussions of all the issues in this case can the PTO ever hope to achieve that worthy goal. Applicant therefore implored Director Rogan to reconsider his decision and adopt a more flexible and cooperative approach by agreeing to meet with Applicant to discuss the handling of this and other pending BlackLight applications before taking any further action.

Perhaps the PTO sees no need to modify its approach, buoyed by the Federal Circuit’s June 28, 2002 Decision upholding its withdrawal action that cancelled issuance of BlackLight’s allowed patent applications. See *BlackLight Power, Inc. v. Director James E. Rogan*, 63 USPQ2d1534 (Fed. Cir. June 28, 2002) [See Attachment B]. The Federal Circuit ruled, among other things, that an “emergency situation” trumped the controlling regulation requiring the PTO to determine the unpatentability of one or more claims before it withdrew the ‘294 application from issue so that the PTO’s mere “concern” over patentability provided adequate basis for the withdrawal. That Decision, aside from the fact that it is erroneous,⁹⁷ does not even begin to resolve other issues that touch on the merits of this case.

⁹⁷ Applicant believes that the Federal Court’s opinion is erroneous due, in part, to its misreading of a concurring opinion of one Justice in a 38-year-old Supreme Court case to support its holding that this supposed “emergency situation”—a finding that was not supported by the record or even argued by the PTO—justified the PTO’s withdrawing BlackLight’s copending ‘294 application from issue on February 17, 2000, after payment of the issue fee. See *BlackLight Power* at page 7 citing *Baltimore & Ohio Railroad Co. v. United States*, 386 U.S. 372, 421 (1964) (Brennan, J., concurring) (recognizing the importance of leaving the Interstate Commerce Commission (ICC) great flexibility to deal with emergency situations to avoid serious damage to the national transportation system, but finding no pressing need that justified the ICC’s action). The Federal Circuit stretched that case way beyond the limits of Supreme Court precedent that requires government agencies to strictly follow statutory and regulatory guidelines.

Incredibly, at oral argument, the PTO did not even suggest that an emergency situation had forced it to withdraw this application from issue on February 17, 2000. To the contrary, PTO Solicitor John M. Whealan argued that no withdrawal—emergency or otherwise—occurred on that date and admitted that,

One such issue is how this alleged “emergency situation” arose in the first place, *i.e.*, how the PTO became aware of BlackLight’s issued U.S. Patent No. 6,024,935 (the ‘935 patent) that supposedly raised “concerns” about other pending applications. That issue apparently was not important to Associate Solicitor Kevin Baer who defended the PTO’s conduct by arguing to the District Court: “I would even say, Your Honor, you could imagine in our head any scenario of how we learned about it. A blimp flying over us. It doesn’t matter, because what matters, Your Honor, is the decision [to withdraw] itself.” [May 22, 2000 Transcript at 22 (Attachment K, Tab E)]

Judge Sullivan, however, was apparently unimpressed by those comments, noting in footnote 10 of his opinion that he was “troubled by several steps in the PTO’s process” and advising the PTO to “examine its patent issuance process so that their normal operations are not compromised by such seemingly suspicious procedures.” [See 109 F.Supp. 2d at 53 (See Attachment L)]

While the PTO may be unconcerned how it learned of the ‘935 patent, Applicant considers that information critically important. If, for instance, competitors were somehow involved in events leading to the withdrawal of BlackLight’s allowed applications and, perhaps, in the subsequent prosecution of those and other applications, that information would relate directly to the credibility of the rejections entered in those cases, including this one. Applicant therefore renews his request for a full accounting of how, out of the thousands of patents the PTO issues every week, his ‘935 patent came to its attention, thus leading to the withdrawal of BlackLight’s allowed applications.⁹⁸

if the Court found otherwise, his case would be seriously compromised. This was because, at that time, the PTO could not locate the patent file and admittedly could not have made a determination of unpatentability of one or more claims as required by the controlling regulation. See 37 C.F.R. § 1.131(b)(3); MPEP § 1308 (7th Ed., Rev. 1, Feb. 2000). To avoid an adverse ruling, Solicitor Whealan sought refuge outside the administrative record, suggesting for the first time that the PTO had used the wrong form in mistakenly notifying Applicant on February 17 that his application had been withdrawn. Then, again without evidentiary support, the Solicitor tried to convince a skeptical Court that Director Kepplinger, in consultation with the Examiner, had made an unpatentability determination sometime later, after Applicant had voluntarily supplied the PTO with a copy of the application—hardly an emergency situation if it were true.

⁹⁸ See Applicant’s February 28, 2000 letter to Director Kepplinger documenting telephone and personal conversations between her and Applicant’s counsel regarding improper outside influence that precipitated

Applicant believes that concerns over outside influences on the prosecution of his applications are fully justified. Following the PTO's withdrawal action, counsel immediately investigated the facts and circumstances surrounding that action by questioning various PTO personnel. In discussions with Director Esther Kepplinger, she admitted to counsel that the withdrawal was a reaction to perceived heat—a "firestorm" as she put it—the PTO had received from an undisclosed outside source. Director Kepplinger further indicated that the withdrawal occurred only after BlackLight's '935 patent had been brought to the attention of then-Director Q. Todd Dickinson by Gregory Aharonian, another PTO outsider well known for publicly attacking issued U.S. patents.

Director Kepplinger's revelations are truly disturbing in that they describe what is, in essence, a newly created non-statutory reexamination procedure for opposing the issuance of patents never envisioned by Congress. *Compare* 35 U.S.C. §§ 301-307 (patent reexamination statutes).

This was but one of several issues Dr. Brewer raised in his letter to Director Rogan as a possible topic for discussion that the PTO says it is "not in a position to discuss . . . at the present time." The PTO's response, however, merely begs the question: if not now, when?

Following the PTO's drastic withdrawal action, Applicant discovered other reliable information suggesting outside interference with BlackLight's patent applications and breaches of the PTO's duty to maintain the confidentiality of those applications. Applicant learned that Dr. Peter Zimmerman, former Chief Scientist for the State Department, had published an Abstract of an upcoming speech to the American Physical Society (APS)—a BlackLight competitor—boasting that his Department and the Patent Office "have fought back with success" against BlackLight. [See Attachment K, Tab C] In conversations with BlackLight's counsel, Dr. Zimmerman admitted that he had received information concerning BlackLight's applications through e-mails from Dr. Robert Park, spokesman for the APS, who told him of a contact in the PTO referred to by Dr. Park as "Deep Throat" with access to confidential patent information. [See Attachment K, Tab C]

the withdrawal of BlackLight's five allowed applications. The PTO cited this letter in its March 22, 2000 Decision affirming its withdrawal action. [See Attachment G]

An *APS News Online* bulletin, dated September 2002, suggests that Dr. Park is maintaining his questionable PTO contacts, apparently with the agency's blessing:

APS E-Board Passes Resolution on Perpetual Motion Machines

The APS Executive Board approved a resolution at its June 2002 meeting in Annapolis, MD, affirming the fraudulent nature of claims of perpetual motion machines.

The resolution was deemed necessary because of a recent increase in patent applications for such devices. Robert Park, APS Director of Public Information and author of the weekly electronic newsletter, "What's New," reported that the US Patent Office has received several patent applications for perpetual motion machines during the first six months of this year alone. [Park's 2000 book, *Voodoo Science*, devoted considerable space to the phenomenon of such devices throughout history.] The text of the APS resolution follows.

The Executive Board of the American Physical Society is concerned that in this period of unprecedented scientific advance, misguided or fraudulent claims of perpetual motion machines and other sources of unlimited free energy are proliferating. Such devices directly violate the most fundamental laws of nature, laws that have guided the scientific progress that is transforming our world.

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[Attachment Q (emphasis added)] Dr. Park's knowledge of the number of pending patent applications filed in the PTO directed to a particular subject matter—information that is supposedly kept confidential—raises additional questions as to his activities in interfering with the prosecution of U.S. patent applications.⁹⁹

Of course, this should come as no surprise since Dr. Park has basically admitted his direct involvement in BlackLight's patent affairs, as evidenced by the September 6, 2002 issue of *What's New* he authored and published on the APS website:

⁹⁹ Not coincidentally, the Committee initially attacked the operability of Applicant's invention by mischaracterizing it as a "perpetual motion machine" and, therefore, *per se* unpatentable. The Committee quickly withdrew that line of attack as Applicant showed it was completely lacking in any merit.

The status of BlackLight Power's intellectual property is fuzzier than ever. BLP was awarded Patent 6,024,935 for "Lower-Energy Hydrogen Methods and Structures," a process for getting hydrogen atoms into a "state below the ground state". . . . You might expect these shrunken hydrogen atoms, called "hydrinos," to have a pretty special chemistry. Do they ever! Indeed, a second patent application titled "Hydride Compounds" had been assigned a number and BLP had paid the fee. Several other patents were in the works. That's when things started heading South. Prompted by an outside inquiry (who would do such a thing?), the patent director became concerned that this hydrino stuff required the orbital electron to behave "contrary to the known laws of physics and chemistry." The Hydride Compounds application [the '294 application] was withdrawn for further review and the other patent applications were rejected. [September 6, 2002 Online Newsletter of Dr. R. Park, *What's New* (Attachment C) (emphasis added)]

Dr. Park's startling admission was confirmed two weeks later in the September 20, 2002 issue of the *Online Newsletter* published by the James Randi Educational Foundation (JREF). In it, James Randi gleefully boasted about Dr. Park's contacting the Patent Office with the express purpose of sabotaging Applicant's patent rights:

But why, hard on the heels of re-examining other questionable patents (see three weeks ago on this page), would the Patent Office have happened upon this particular one [BlackLight's withdrawn '294 application], when there are so many in this category? The secret can be inferred from Bob Park's weekly column, where we find: "Prompted by an outside inquiry (who would do such a thing?) . . ." That rascal!

The very fact that the Patent Office has paid heed to the complaints that Park, the JREF, and others have made, speaks well for rationality. Let's hope that we can look forward to many quack devices and systems being re-evaluated. Let's see a lot more of this "extraordinary action" from the Director. As for BlackLight Power, says Park, "Their long-awaited IPO may have to wait a little longer." [September 20, 2002 Online Newsletter of the JREF, *Swift* (Attachment C) (emphasis added)]

Despite all of this overwhelming incriminating evidence of improper outside interference by competitors with an administrative patent proceeding, the PTO prefers to ignore this matter. Apparently, this is not the first time that these same players—Dr. Park, James Randi and PTO officials—have been embroiled in a patent controversy such as this one involving improper interference with a patent proceeding. Less than a year before Applicant's five allowed applications were withdrawn from issue in February 2000, the PTO was caught up in another scandal of sorts involving the issuance of U.S.

Patent Nos. 5,748,088 and 6,011,476, granted on a device that can identify the obscured location of living entities. Following issuance of the '088 patent, Dr. Park published in his *What's New* newsletter inaccurate, disparaging remarks, which were picked up by James Randi on his JREF website, concerning the operation and reliability of the claimed invention. An article published in *Science Magazine* during the pendency of the '476 patent also reported on the controversy and the involvement of Sandia National Labs (SNL) in the testing of the device. [Attachment D] That involvement and the disclosure of confidential information to David Voss, author of the *Science* article, was itself the subject of some controversy and resulted in the issuance of an internal PTO memorandum that was placed in the '476 patent file.

In that memorandum, the PTO felt compelled to reiterate its policy forbidding PTO employees from making public disclosures concerning pending patent applications:

PTO MEMORANDUM FOR ALL EMPLOYEES: MEDIA CONTACT POLICY

Posted Date: 06/25/99
Removal Date: 07/06/99

UNITED STATES DEPARTMENT OF COMMERCE
Patent and Trademark Office
ASSISTANT SECRETARY AND COMMISSIONER OF PATENTS AND
TRADEMARKS
Washington, D.C. 20231

June 22, 1999

99-42

MEMORANDUM FOR All Employees

FROM: Acting Assistant Secretary of Commerce and Acting
Commissioner of Patents and Trademarks

SUBJECT: Media Contact Policy

Since a memorandum on this subject was first issued several years ago, thousands of new employees have joined the PTO. Therefore, it is a good

time to reiterate PTO policy concerning employee contact with members of the media including, but not limited to, those in print, broadcast, cable, and online publications.

All requests, including telephone and e-mail, from members of the media for interviews, tours, and appearances should be directed to the Office of Public Affairs (Richard Maulsby or Brigid Quinn). Public Affairs will then determine the appropriate Office response for such requests and arrange for all interviews and any other meetings with the media. A member of the Public Affairs staff may attend interviews and meetings.

This policy applies only to contact with the media, not to interactions with customers. Any questions about media contact should be directed to the Office of Public Affairs at 305-8341.

Additionally, MPEP section 1701 and TMEP section 1801 specify that Office personnel should not comment on the validity or enforceability of any U.S. patent or trademark registration. These sections also caution employees about answering other particular inquiries concerning U.S. patents or trademark registrations. Any questions on this policy should be directed to your supervisor or to the MPEP Editor at 305-8813 for patents or to the Office of the Assistant Commissioner for Trademarks at 308-8900. [Attachment E]

Curiously, SNL is where Dr. Park previously served as head of its Surface Physics Division, leading Applicant to wonder whether SNL, or any of its sister labs, have had any similar involvement in the examination of this and other BlackLight applications. Applicant's curiosity on this point is further heightened by the fact that Examiner Bernard Eng-Kie Souw, a former employee with Brookhaven National Labs, has been engaged in the examination of BlackLight's patent applications for some time now. [See, e.g., Serial No. 09/513,768]

If, as Applicant suspects, the PTO has conferred with anyone having ties to the APS, like Dr. Park or Dr. Zimmerman, or to other BlackLight competitors in withdrawing or rejecting BlackLight's applications, that information would be highly relevant and thus must be disclosed. Clearly, knowing the identity and potential biases of all persons providing input or otherwise involved in rejecting BlackLight's applications, especially those with competing interests, bears directly on the credibility of those rejections.

Applicant has, on numerous occasions, disclosed to PTO officials information relating to Dr. Park's undermining of BlackLight's patent rights, as relayed in Dr.

Brewer's December 21, 2001 letter to then PTO Director Rogan, only to be ignored. [Attachment A. See also, for example, January 19, 2001 Letter to Director Kepplinger (Attachment K)] As Dr. Brewer explained in his letter, BlackLight is obviously concerned, among other things, that the PTO, once again, may have breached its duty to maintain confidentiality of U.S. patent applications under 35 U.S.C. § 122, 18 U.S.C. § 2071, 37 C.F.R. § 1.14, and M.P.E.P. § 101. The PTO's curt statement that it is "not in a position to discuss the issue at the present time" does little to allay those concerns.

Dr. Brewer further expressed in his letter distress over the suspected compromise of Applicant's patent rights to his novel hydrogen chemistry by a group of physicists with a vested interest in maintaining federal funding for projects based on a competing scientific theory and that those physicists continue to exert improper influence on the prosecution of BlackLight's pending applications.

Those suspicions are only fueled by continued PTO silence on these issues while it undercuts Applicant's patent rights based on statements of competitors like Dr. Park. For instance, In its March 22, 2000 Decision, the PTO justified its withdrawal action by relying, in part, on a *Washington Post* article written by Dr. Park only slightly more than a month prior to the withdrawal:

While petitioner in the accompanying letter points to favorable testimonials from scientists and entrepreneurs regarding the "revolutionary technology" that the instant application is asserted to embody, this does not establish that either the Director, Technology Center 1700, or the Director, Special Programs Law Office, committed reversible error, nor that the Notice should be withdrawn. In contrast, mainstream newspapers have reported this same "revolutionary technology" is accompanied by controversy in the scientific community. See Baard et al., Scientists and entrepreneurs have lots of ideas about new sources of energy; some may even be practical, *Wall St. J.*, Sept. 13, 1999, at R16; **Park, Perpetual motion; still going around, *Washington Post*, Jan. 12, 2000, at H3.** [March 22 Decision at 7 (Attachment G)]

Applicant is naturally skeptical that this timing was simply a coincidence. Regardless, the mere fact that the PTO would rely on any competitor to "bad-mouth" BlackLight's technology is troubling. That it relied on Dr. Park of all people, known for conducting "hatchet jobs" on new technologies that threaten federal funding for the physicists he represents, is contemptible.

The same *Washington Post* that ran Dr. Park's libelous article rebuked its less than credible author in a subsequent article confirming his reputation for engaging in what it described a "search-and-destroy mission" against inventors and scientists who seek to advance the bounds of science. [See Article dated June 25, 2000 (Attachment M)] To quote the article's exact words, "Park's anger permeates his rebuttals, which border on character assassination." Noting that "thoroughness is not Park's strong suit," the article goes on to suggest that his intentions may be less than honorable:

Park's failure to gather first-hand data is unfortunate, but his selective omissions are far more serious. In at least one case, he violated basic principles of journalism and science itself by apparently suppressing information that conflicts with his foregone conclusion. . . . Such tactics are reminiscent of the behavior of a zealous DA who is so convinced that a suspect is guilty that he feels entitled to withhold some information from the jury.

Dr. Park's competitive motives in attacking BlackLight's novel hydrogen chemistry, and thereby undermining its patent rights, are clear, as further recognized by the *Post* article in its description of Dr. Park as "a Washington lobbyist and PR flack for the American Physical Society." The article goes on to warn of the serious effects a rush to judgment can have without first-hand review of experimental evidence:

This is a serious matter, since even poorly documented vitriol can jeopardize a scientist's reputation and future funding if it is disseminated with the complicity of a respected organization such as the American Physical Society.

Incredibly, in rationalizing its withdrawal action, the PTO pays tribute to a "hatchet man" like Dr. Park, who never lets scientific evidence interfere with sabotaging a competitor, by citing his hostile statements against BlackLight. Yet, in explaining the issuance of BlackLight's '935 patent, the PTO publicly denigrates its entire examining corps, known for their careful study of experimental evidence in deciding whether to issue U.S. patents:

[P]atent examiners do review [patent applications]. Unfortunately, patent examiners are swamped and sometimes things slip through. [Statement of Associate Solicitor Baer in *BlackLight Power, Inc. v. Q. Todd Dickinson*, May 22, 2000 Tr. at 7 (Attachment K, Tab A)]

[E]xaminers are under tremendous pressure to produce work, and if they're going to approve [an application], they just approve it and kind of let it out the door. [May 22, 2000 Tr. at 48 (Attachment K, Tab A)]

As Dr. Brewer pointed out in his letter to Director Rogan, the PTO, in making these outrageous public statements, undercuts the statutory presumption of validity that has attached to every issued U.S. patent for well over 50 years:

Presumption of validity; defenses

A patent shall be presumed valid. Each claim of a patent (whether in independent, dependent, or multiple dependent form) shall be presumed valid independently of the validity of other claims; dependent or multiple dependent claims shall be presumed valid even though dependent upon an invalid claim. The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity.

Underlying this statutory presumption is the premise of administrative regularity, which presumes that well-trained examiners with expertise in their respective fields properly carry out their examination duties by issuing only valid patents. See, e.g., American Hoist & Derrick Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1359 (Fed. Cir. 1984). This presumption was, in fact, confirmed by the capable work of Examiners Langel and Kalafut who, with over 50 years of experience between them, examined and allowed Applicant's '935 patent, along with BlackLight's withdrawn applications.¹⁰⁰

As succinctly stated in Dr. Brewer's letter, Solicitor Baer's statements on behalf of the PTO should be alarming to just about everyone, with the possible exception of accused patent infringers, and most certainly do not reflect well on an agency charged with maintaining the integrity of the patent system. Applicant felt that a meeting with Director Rogan to secure a retraction of those statements would be mutually beneficial to both sides. Yet once again, inexplicably, the PTO was not, and presumably is still not, prepared to discuss this issue.

These and other unfair assaults on Applicant's patent rights leave him to ponder: What would motivate the PTO to conduct itself with such total disregard for U.S. patent

¹⁰⁰ The Examiners initially rejected all claims in these cases, but after conducting five lengthy personal interviews with Applicant and carefully considering Applicant's experimental evidence, they ultimately allowed those claims.

laws and regulations governing its administrative authority just to attack this one Applicant?

Applicant's fear is that these attacks may be attributable to competitors, like Dr. Park, who are coordinating an organized smear campaign to discredit BlackLight's technology. That fear is only heightened by the PTO's hiding behind strained theoretical arguments as an excuse for refusing to fairly evaluate Applicant's experimental evidence, while using its Secret Committee to issue anonymous rejections in this and other BlackLight applications. Dr. Brewer also brought these issues to Director Rogan's attention as an agenda item for a meeting that, unfortunately, has never taken place.

Applicant, however, has a right to know the identity and qualifications of all persons providing input to, or otherwise participating in, the examination process. This information bears directly on the credibility of the rejections that have been entered in this and other BlackLight applications. For instance, if Dr. Park or any of his physicist cronies have been consulted in denying Applicant his patent rights, it would certainly explain the arbitrary and capricious handling of the experimental evidence of record in those cases.

Particularly germane is the identity of those persons responsible for, or otherwise involved in, creating the Office Actions, Attachments, and Appendices that make up the record in this application and other BlackLight cases. To this day, the Committee has refused, without any adequate explanation, to provide this vital information to the detriment of Applicant.

Furthermore, Applicant is entitled to know which PTO officials are ultimately responsible for analyzing Applicant's scientific data evidencing the existence of lower-energy hydrogen, and which officials have the final authority to decide the fate of BlackLight's applications. The Committee's unfair refusal to divulge that information has also seriously handicapped Applicant's ability to effectively respond to and overcome the rejections of record.

For instance, Applicant has been stymied on numerous occasions in attempts to discover the basis for various positions articulated by the Committee, or the status of certain actions it has taken. Seldom are the Examiners of record, who are mere

signatories to the Committee's handiwork, or their immediate supervisors, able to give any useful guidance on those subjects, either because they have no authority to do so and cannot divulge who does, or, in some cases, they do not know who even has custody of the patent file so as to investigate the answer to a particular question.

Knowing who is responsible for analyzing the record evidence would also allow Applicant to assess that person's qualifications, as compared to those Ph.D. scientists who have peer reviewed the published experimental evidence confirming lower energy states of hydrogen. Equally important, by knowing who has authority to issue BlackLight's applications, Applicant can more easily ascertain and satisfy the patentability standards being applied in rejecting claims to his novel hydrogen technology.

Illustrating this last point, Applicant attempted to force the Secret Committee to set reasonable standards by which his data could be accepted as reliable proof by requesting the personal Interview that was held on February 21, 2001. Of course, to effectively determine the standards being applied against Applicant, he first had to identify the person(s) responsible for setting those standards.

Applicant, however, was only partially successful in that effort. Prior to the February 21 Interview, Applicant's counsel uncovered the identity of only one Committee member, Examiner Vasu Jagannathan, who played a role in rejecting BlackLight's applications. Incredibly, Examiner Jagannathan initially denied any such involvement, accurately noting that his name did not appear anywhere in the record. He therefore refused counsel's explicit request that he attend the upcoming Interview. Only after counsel wrote to a high-level supervisor demanding that Examiner Jagannathan attend did counsel receive confirmation that the Examiner was "directly involved in the creation of the Office Action" to be discussed at the Interview and that he would indeed attend. [See January 19, 2001 letter to Director Esther Keplinger (Attachment K) and February 12, 2001 Letter from Director Jacqueline M. Stone (Attachment N)]

Examiner Jagannathan confirmed his direct involvement by leading the Interview discussions. The Examiner's participation afforded Applicant an opportunity to assess his qualifications to examine and evaluate the experimental evidence of record. Applicant was astonished to hear Examiner Jagannathan basically admit he was

unqualified to do so based on several of his comments. One of those comments, as discussed previously, included his characterization of Applicant's highly reliable spectroscopic data confirming lower energy states of hydrogen as a "bunch of squiggly lines."

When pressed for guidance on what standards he used to evaluate Applicant's scientific data and to decide whether to issue his patents, Examiner Jagannathan would not elaborate. Rather, he proposed a new standard requiring Applicant to submit and publish his data in peer-reviewed journal articles before he would give it serious consideration. Despite strenuous objections to this newly minted standard, Applicant nonetheless worked diligently to comply with it.

Over the subsequent years, Applicant has used vast resources to present experimental evidence of lower energy states of hydrogen—much of it generated by independent third parties—in over 50 peer-reviewed articles published in the prestigious scientific journals mentioned above. Despite this significant accomplishment, the Committee, true to form, has essentially ignored that published evidence.

It should be further noted that Applicant has successfully met the Committee's new "publication" standard despite attempts by Applicant's detractors, most notably Dr. Zimmerman, to undermine that effort. [See Attachment H] Applicant's discovery that Dr. Zimmerman has been contacting various journals to dissuade publication of Applicant's articles is especially alarming given that the Committee has relied on non-peer reviewed statements by him—statements that were posted in an internet chat room of all places and that he readily admits are biased—to reject claims in BlackLight applications.

If, as Applicant suspects, the Committee has cooperated with Dr. Zimmerman, or other such biased individuals, in denying Applicant his patent rights, while those same individuals have worked behind the scenes to undermine Applicant's compliance with the Committee's concocted publication requirement, again, that critical information should be disclosed without further delay.

Applicant is hardly surprised by his inability to break the PTO's code of silence on the suspicious handling of BlackLight's applications given that the PTO has stonewalled similar inquiries from five U.S. Senators—four of whom requested that Senator Patrick

Leahy, Chairman of the Judiciary Committee overseeing the PTO, and/or Commerce Secretary Donald Evans, look into this matter. [See letters to and from Senators Max Cleland, Robert Torricelli, Jon Corzine, Ron Wyden, and Gordon Smith (Attachment O)] The PTO's continued refusal to respond to the Senators' inquiries suggests that, perhaps, it has something to hide.¹⁰¹

If the PTO looks to the Federal Circuit's June 28, 2002 Decision for license to continue its hostile prosecution through secret examination, it will not find it. Indeed, Judge Newman, in rationalizing her ruling, incorrectly assumed that the PTO would fairly and expeditiously prosecute BlackLight's applications:

Such action must of course be reasonable under the circumstances and rare in occurrence, lest the emergency become the rule. But when necessary in order to fulfill the PTO's mission, with safeguards to the interests of the applicant including fair and expeditious further examination, we agree with the district court that the action taken is a permissible implementation of the statute and regulation. [See *BlackLight Power* at pages 1537 (Attachment B) (emphasis added).]

Nothing could be further from the truth. As documented by Applicant, the PTO's prosecution of BlackLight's applications has been nothing short of hostile and its attempt to hide the mistreatment of Applicant behind the authority of a Secret Committee only exacerbates the unfairness of those actions. This untenable situation has failed to provide the safeguards to the interests of Applicant, including fair and expeditious further examination, contemplated by the Federal Circuit in its Decision and, therefore, has prompted Applicant to herein request an equitable remedy that the PTO immediately issue all five withdrawn BlackLight applications that gave rise to that Decision. [See Demand for Information and Redress, *infra*.]

Applicant strongly urges the PTO to break its silence and to engage in an open and honest discussion on the merits of the issues that continue to plague BlackLight's

¹⁰¹ In the PTO's reply to the Senators' inquiry letters, Robert L. Stoll, Administrator for External Affairs, contended that any comments in response to those inquiries would be "inappropriate" because of the then-pending appeal to the Federal Circuit in *BlackLight Power Inc. v. Dickinson*, Civ. No. 00-0422 (D.D.C.). [See Attachment O] Putting aside the fact that the issues then on appeal had absolutely nothing to do with the points of inquiry, this contrived excuse has gone stale as the Federal Circuit decided that case years ago in June 2002. [See Attachment B] By its own statements, nothing now prevents the PTO from cooperating with the U.S. Senate regarding the administrative irregularities brought to its attention.

remaining applications. Applicant renews his earlier commitment, as expressed in Dr. Brewer's December 21, 2001 letter, to meet with the PTO Director and/or any other government officials, anywhere, anytime, to resolve these outstanding issues. Applicant sincerely hopes that the Director will likewise commit himself to achieving the same objective so that a fair and expeditious prosecution of BlackLight's applications that safeguards Applicant's interests, as envisioned by the Federal Circuit, can finally move forward with mutually beneficial results.

Part of that forward movement should include proper consideration of the overwhelming experimental evidence confirming the utility and enablement of Applicant's claimed invention. In view of that evidence, Applicant submits that the rejections under 35 U.S.C. §§ 101 and 112 are misplaced and should be withdrawn, and that the present application is in condition for allowance.

**Discussions Held And Agreements Reached
During The February 11, 2003 Interview**

The above-mentioned problems associated with the Secret Committee's examination of this and other BlackLight applications can be summarized as follows based on its failure to:

- (1) identify all persons from within and outside the Patent Office who contributed to, or were otherwise involved in, withdrawing or rejecting BlackLight's applications;
- (2) identify those persons having ultimate authority to analyze the vast body of experimental evidence demonstrating the existence of lower energy states of hydrogen and, based on that analysis, for deciding whether to issue patents on Applicant's novel hydrogen technology;
- (3) establish and apply consistent patentability standards and guidelines by which that patentability decision is to be made; and
- (4) properly analyze the evidence of record—now published, or to be published, in over 50 peer-reviewed journal articles—that the Committee required Applicant to submit.

The Committee merely perpetuated those failures in its previous Office Actions by dismissing, without serious analysis, Applicant's submitted data evidencing lower energy states of hydrogen. Frustrated by the Committee's inaction, but still determined to get a fair hearing, Applicant requested and received the courtesy of another personal Interview, held February 11, 2003, to present his evidence and to discern the standards by which the ultimate decision-maker would be evaluating it.¹⁰²

To that end, Applicant repeatedly requested that Examiner Jagannathan attend the Interview, since he had led the prior Interview held February 21, 2001, and, despite attempts to keep his identity secret, he was the only person known to have been directly involved in creating the substantive Office Actions of record. Specifically, Applicant sought to question Examiner Jagannathan on why he still refused to accept Applicant's scientific data evidencing lower-energy hydrogen after it had been published, or was soon to be published, in what was then over 40 (now over 50) peer-reviewed journal articles, which he himself had required. Applicant, however, never got the chance to pose that question. Without explanation, Examiner Jagannathan refused to attend the Interview, just as he had refused to attend the Interview held two years earlier—only this time, he did not show up.

Applicant also requested that Examiners Wayne Langel and Stephen Kalafut attend the Interview, since they had previously allowed the five BlackLight applications that were mysteriously withdrawn from issue and their names were the only ones appearing in the record as signers of the substantive Office Actions under consideration. Examiners Langel and Kalafut did appear for the Interview, together with their immediate supervisors, SPE's Patrick Ryan and Stanley Silverman. Examiner William Wayner, who is assigned to one BlackLight application and expressed an interest in attending the Interview, also appeared.

Also attending the Interview and leading the discussions on the PTO's behalf was Quality Assurance Specialist Douglas McGinty, who until that time had never been identified to Applicant as having played any role in the examination of his applications.

¹⁰² Although the Interview Summary does not specifically list the serial number of all BlackLight applications as being the subject of the February 11, 2003 Interview, Examiners Langel and Kalafut agreed beforehand that the Interview would be held to address the similar rejection of claims in all assigned cases based on an alleged lack of utility and inoperability.

Attending the Interview on behalf of BlackLight Power were the inventor, Dr. Randell L. Mills, his counsel, Jeffrey S. Melcher and Jeffrey A. Simenauer, and company Director Dr. Shelby Brewer.

Also attending the Interview as an observer at Applicant's request was Ted C. Liu, Senior Legislative Assistant for Congressman David Wu, who represents the 1st District of Oregon.

During the Interview, Applicant made a sincere effort to advance the prosecution of his applications and to find common ground upon which all of these cases, once again, would be allowed to issue as patents. Applicant believed it was a worthwhile effort in light of Examiner Langel's statements on the record reaffirming his consistent view that Applicant's novel hydrogen technology is fully operable and, therefore, entitled to patent protection. The Interview was also significant in view of the following representations and agreements that resulted from the discussions between Applicant and lead-Specialist McGinty:

- (1) Applicant will identify the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties;
- (2) the Examiners whose signatures appear on the rejections of record, *i.e.*, Examiners Langel, Kalafut, and Wayner, have full authority to review that data and, based on their review, to issue patents as deemed appropriate; and
- (3) Applicant will confer with the signatory Examiners, either by telephone or in person, to review each assigned application on a claim-by-claim basis to ensure that the scientific data presented adequately supports the scope of the claims. For those claims determined to be adequately supported by the data, a patent will issue. For any claims deemed to be inadequately supported, Applicant reserves the right to continue seeking that broader claim coverage in subsequent proceedings.

Applicant appreciated the guidance Specialist McGinty provided during the Interview for securing BlackLight's patents. Based on that guidance, Applicant presented comments in several copending applications for which Responses were due detailing the substance of discussions held at the Patent Office on February 11th and

identifying the independent, third-party data per agreement (1) above, which information is reproduced below. [U.S. Serial Nos. 09/110,678 and 09/362,693]

Applicant's comments confirmed Examiner Langel's long-held view that the claims in those cases were in condition for allowance. Applicant therefore requested that Examiner Langel exercise his authority to issue a Notice to that effect per agreement (2) above so that a patent could then be issued.

Following up on the Responses filed in those copending applications per agreement (3) above, Applicant arranged for an Interview with Examiner Langel to review the cases on a claim-by-claim basis to ensure that the scientific data presented adequately supported the scope of the claims in those cases. In fact, Applicant and Examiner Langel reached a tentative understanding that certain claims were adequately supported by the data and that Applicant was therefore entitled a patent.

Unfortunately for Applicant, that understanding was short-lived after Examiner Langel agreed, under the most grievous of circumstances, to his removal from examining all BlackLight applications to which he was assigned. Before discussing the negative aspects of that incident, however, Applicant presents the following recap of the discussions held during the February 11, 2003 Interview that lead to the above agreements.¹⁰³

Just prior to the Interview, Specialist McGinty asked that Mr. Liu speak by telephone with Talis Dzenitis, a Congressional Affairs Specialist in the PTO's Legislative and International Affairs Office, to discuss his reasons for attending. Mr. Liu explained to Specialist Dzenitis that a constituent associated with BlackLight had contacted Congressman David Wu complaining of the irregular procedures the PTO has used in examining the company's pending patent applications. The procedures complained of included the PTO's withdrawal of the five applications approved by Examiners Langel and Kalafut for issuance as patents and the subsequent rejection of those and other BlackLight applications by an unknown group of PTO officials referred to by Applicant as a "Secret Committee."

¹⁰³ Much of the substance of these discussions was confirmed in e-mail correspondence between Mr. Liu and Applicant's Counsel. [See Attachment P]

Specialist Dzenitis represented to Mr. Liu that no such secret committee exists at the Patent Office. Applicant was surprised by that representation considering that a group of anonymous PTO officials are known to be handling BlackLight's applications and drafting the substantive Office Actions that the Examiners of record are instructed to sign.

Examiner Langel confirmed as much in an extended discussion he had with Mr. Liu and Applicant's counsel following the formal phase of the Interview. During that discussion, Examiner Langel repeated his prior denials of having authored the substantive Office Actions of record in the BlackLight applications to which he was assigned, even though those Actions bear his signature. Examiner Langel also repeated his previously expressed view that Applicant is entitled to patents on his novel hydrogen technology and that he wanted to issue those patents. Examiner Langel explained, however, that other PTO officials unknown to him having higher authority were responsible for drafting the substantive Office Actions he signed and for deciding whether to issue Applicant his patents.

The only person Examiner Langel could identify for Mr. Liu as "having something to do with the Office Actions" was Examiner Jagannathan, whose name does not appear on any Office Action. As noted above, Examiner Jagannathan kept his identity a secret from Applicant until counsel exposed his direct involvement in creating the Office Actions of record and forced him to attend the prior Interview that he led on February 21, 2001. When the recent February 11, 2003 Interview started, it was Specialist McGinty, another previously unidentified PTO official, who led the discussion.

Following the telephone conversation with Specialist Dzenitis, in which he denied the existence of a secret committee, Mr. Liu joined the Interview already in progress. Applicant began the Interview with a general discussion of his novel hydrogen technology and a presentation of the experimental evidence confirming its operation and utility. Specifically, Applicant explained to the PTO officials in attendance how independent laboratory studies, including those conducted by a leading Los Alamos researcher and by a NASA funded group, as well as other highly reliable scientific data, demonstrate the existence of lower energy states of hydrogen underlying his technology.

At no time during Applicant's presentation did the PTO officials analyze or otherwise address to any significant degree the merits of that data proving the existence of lower-energy hydrogen. Rather, these officials—with the exception of Examiner Langel—raised non-technical arguments, similar to those raised in the pending Office Actions, why lower-energy hydrogen could not exist and, thus, why they were justified in according the real-world data little or no weight.

The first such argument, raised by Examiner Wayner, was based on unrelated technologies that have been subjected to ridicule in the scientific community, such as perpetual motion, cold fusion, and 100-miles-per-gallon carburetors. Examiner Wayner compared those controversial technologies to BlackLight's novel hydrogen chemistry and then asked Applicant: "How is your invention any different?"

Applicant pointed out significant differences. Unlike the far-fetched inventions mentioned by Examiner Wayner, Applicant explained that his inventions have been actually reduced to practice, as demonstrated by the many working prototype energy cells developed over the past ten years and the novel chemical compounds produced by the process, which were made available to the PTO in the past and again during the Interview. In fact, Applicant invited the PTO officials to visit his laboratory in Cranbury, New Jersey and witness the operation of his energy cells for themselves, but like prior invitations, this one too was ignored.

Applicant further distinguished his claimed inventions based on the substantial body of experimental evidence that corroborates the existence of lower energy states of hydrogen. Again, none of the PTO officials who raised non-technical arguments questioning the operability of Applicant's novel hydrogen technology made any real attempt to analyze that corroborating evidence. Indeed, Examiner Wayner frankly admitted that his background was in mechanical engineering and, therefore, he was not qualified to conduct such an analysis.

Examiner Wayner also questioned why, if BlackLight's technology was such an important discovery, the company had not yet developed a commercial device for producing energy. Applicant explained that the high cost of developing commercial products was an impediment and that, because BlackLight was not positioned to handle

commercial development, it was looking to license patents on its technology to other companies for commercialization purposes.

Concerned that Examiner Wayner might be introducing yet another new patentability standard, requiring the sale of a commercial product, counsel pressed the Examiner on whether that was his intention. Examiner Wayner plainly stated it was not and, in response to a specific question from Mr. Liu, affirmed that Applicant need not prove commercial applicability to secure a patent for his invention.

Applicant also became alarmed when Examiner Wayner, in referring generally to BlackLight's "detractors," invoked only the name of APS lobbyist and spokesman Dr. Robert Park as someone who disputes the existence of lower energy states of hydrogen. Applicant's counsel wanted to raise issues relating to Dr. Park's "Deep Throat" contact in the Patent Office and his reputation for conducting "hatchet jobs" on new technologies that threaten his lobbying of hundreds of millions of dollars on behalf of the APS to federally fund its pet projects. Specialist McGinty, however, cut counsel off, refusing to discuss the matter. When Specialist McGinty suggested that BlackLight has a "similar agenda," noting its recent NASA contract, Applicant corrected him, explaining that BlackLight does not receive any government funding for its research. Specialist McGinty had no response and the discussion moved onto other, less controversial subjects.

Examiner Wayner raised other issues regarding the reliability of the scientific evidence presented by Applicant. That evidence included spectroscopic data, which counsel described as being equivalent to a "chemical fingerprint." Counsel further noted that Dr. Park himself, whom Examiner Wayner identified as BlackLight's chief antagonist, has proclaimed the extraordinary reliability of spectroscopic data. [See *supra*.]

Yet when Applicant tried to present this highly reliable spectroscopic data at the Interview showing the spectral lines corresponding to lower-energy hydrogen, *i.e.*, a "hydrino" state, Examiner Wayner interrupted, stating that "spectroscopic lines are meaningless" and "don't mean a hill of beans" to him.

Counsel again became concerned that BlackLight's applications were being evaluated using rather loose patentability standards. Counsel therefore requested that

the PTO officials provide some guidance regarding the evidentiary requirements they were imposing on Applicant. Specialist McGinty and Examiner Wayner at first did not respond directly to Counsel's request for guidance, but rather began questioning the accuracy of the test data Applicant submitted to confirm the existence of lower energy hydrogen.

Applicant explained that the submitted test data was generated by highly qualified Ph.D. scientists, many of whom represent independent laboratories. Applicant further noted how this data had been extensively peer-reviewed in the 40-plus (now over 50) articles published, or soon to be published, in prestigious scientific journals, including the *Journal of Applied Physics*. Applicant also provided Specialist McGinty—much to his surprise—with specific data showing the lower-energy state spectral lines that were published in the prestigious spectroscopic publication, *Journal of Molecular Structure*.

Applicant was astounded by the refusal of Specialist McGinty and Examiner Wayner to accept the reliability of the scientific data appearing in these published journal articles, especially considering the PTO's routine acceptance of evidence submitted in printed publications to overcome utility rejections. See, e.g., MPEP § 2107.01 (VI) pp. 2100-33 ("An applicant can [submit evidence in response to a utility rejection] using any combination of the following: amendments to the claims, arguments or reasoning, or new evidence submitted in an affidavit or declaration under 37 CFR 1.132, or in **a printed publication.**" (emphasis added)).

Counsel also reminded the PTO officials of the standard imposed by lead-Examiner Jagannathan during the previous Interview held February 21, 2001 that conditioned his consideration of evidence of lower-energy hydrogen on its publication in peer-reviewed journal articles based on the reliability of the peer-review process. Counsel then noted once again that, despite Examiner Jagannathan's failure to provide legal authority for imposing this unreasonable standard, Applicant had not only met it, but had exceeded it with over 40 (now over 50) journal articles. Having done so, counsel expressed extreme frustration with the PTO's continued refusal to seriously analyze the published scientific data based on manufactured excuses, such as this newly concocted one concerning the accuracy of Applicant's data.

Specialist McGinty raised yet another weak excuse for ignoring the published data by asking what assurances Applicant could provide that the journal articles had been actually peer reviewed! Mystified by that question, Applicant could only state what is a simple known fact: to get scientific data published in a journal article, it must first go through a rigorous peer-review process. Indeed, many of Applicant's articles went through numerous drafts and required further experimentation as directed by the Ph.D. scientists who peer reviewed those articles.

At that point in the Interview, Specialist McGinty admitted that, like Examiner Wayner, he was not qualified to analyze the published data. Applicant was surprised by that admission, since the Interview was being led by Specialist McGinty and had been arranged for the express purpose of presenting the experimental evidence of record.

Examiner McGinty's admission merely fueled Applicant's prior concerns that his published scientific data was not being properly considered, prompting counsel to ask who was responsible for analyzing that data. Specialist McGinty replied by stating that Examiners Langel and Kalafut, the Examiners of record, had that responsibility. That too came as a surprise, since Examiners Langel and Kalafut, of course, were the ones who had originally reviewed Applicant's experimental evidence in allowing the five BlackLight applications that were subsequently withdrawn from issue. Applicant, however, was relieved to learn that these two Examiners, who had over 50 years of experience between them and who were obviously qualified to analyze the published data, were being reassigned that task.

Counsel then addressed the vexing problem of constantly changing patentability standards that had been plaguing the examination process. Counsel specifically mentioned, for example, the prior Office Action that claimed Applicant's lower-energy hydrogen technology violated known laws of physics and chemistry without specifically identifying even one such law, and then required Applicant to prove otherwise.

Counsel also cited a recent Office Action dismissing Applicant's scientific data out of hand for failing to prove the invalidity of quantum theory:

The request for reconsideration has been entered and considered but does not overcome the rejection . . . because there is no evidence presented which would prove applicant's contention that the theory of quantum mechanics is invalid."
[October 7, 2002 Advisory Action entered in U.S. Serial No. 09/110,717]

When Specialist McGinty accused Applicant of putting a "spin" on the Examiner's rejection, counsel noted that he had been reading the above quotation directly from the Office Action.

Counsel also mentioned other recent Office Actions filed in BlackLight cases that dismissed Applicant's recent submission of peer-reviewed journal articles, in accordance with the standards imposed by Examiner Jagannathan, as being merely "cumulative" when it clearly was not and even the originally submitted evidence had not been properly analyzed.

Expressing frustration over the PTO's failure to provide any consistent patentability standards to guide Applicant, counsel once again requested that Specialist McGinty provide such guidance. Specialist McGinty again raised concern over the integrity of the experimental evidence, but indicated that he would be more receptive to that evidence if it was validated by independent third parties.¹⁰⁴

Applicant explained to Specialist McGinty that much of the evidence submitted over the previous four years was, in fact, generated by independent third parties. Applicant then began citing examples of the extensive independent third-party evidence disclosed in publications previously cited to the PTO, as well as more recently generated evidence that was subsequently submitted.¹⁰⁵ Specialist McGinty did not respond, whereupon counsel noted that his unfounded concern that the record evidence

¹⁰⁴ Just as Specialist McGinty sought assurances at the February 11 Interview that persons involved in generating and furnishing the scientific data submitted by Applicant are independent and unbiased, Applicant deserves similar assurances that those involved in rejecting BlackLight's applications are also independent and unbiased. Despite Applicant's repeated requests for such assurances, none have been given.

¹⁰⁵ See R. L. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", *Int. J. Hydrogen Energy*, Vol. 26, No. 9, (2001), pp. 965-979.

R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", *J. Mol. Struct.*, Vol. 643, No. 1-3, (2002), pp. 43-54.

J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", *Journal of Applied Physics*, submitted.

A. J. Marchese, P. M. Jansson, J. L. Schmalzel, "The BlackLight Rocket Engine", Phase I Final Report, NASA Institute for Advanced Concepts Phase I, May 1-November 30, 2002, http://www.niac.usra.edu/files/studies/final_report/pdf/752Marchese.pdf.

lacked third-party validation merely demonstrated the PTO's failure to thoroughly analyze that evidence.

Further demonstrating a lack of familiarity with the record evidence, Specialist McGinty criticized Applicant's experimental evidence as a whole by referring numerous times to only high-power plasma data. Applicant repeatedly pointed out that the plasma data was but a small fraction of the submitted evidence and that it was presented primarily to provide additional support for his plasma-related applications.

Applicant noted that the vast body of other scientific data he submitted relates to a broad range of analytical studies demonstrating the existence of lower energy states of hydrogen. For example, regarding those applications relating to novel chemical compounds, Applicant pointed Specialist McGinty to the extensive spectroscopic data supporting the identification of those compounds. Specialist McGinty, however, apparently did not understand the significance of that data, stating that the NMR data confirming lower-energy hydrogen could have been due to nitrogen. Applicant had to explain that, as a matter of basic scientific knowledge, NMR data only shows protons and that no other element but hydrogen is in the data range. Applicant also explained that the NMR data confirms the presence of an internal energy source.

Knowing that highly qualified Examiners Langel and Kalafut were once again responsible for analyzing the published data was reassuring. There still remained, however, one nagging issue, namely, who had the ultimate authority to issue Applicant his patents. Counsel expressed concern that the pending applications were being examined in secret and that, without knowing who had that authority, Applicant was being unfairly denied an opportunity to present his case to the actual decision-maker.

Specialist McGinty then stated in no uncertain terms that Examiners Langel, Kalafut, and Wayner, the signers of the Office Actions under consideration, had "full authority" to examine the pending applications and to issue the patents.

Upon hearing that statement, counsel immediately turned to Examiner Langel and asked him point blank whether, after having studied the experimental evidence of record, he still believes that BlackLight's patent applications were allowable. The Examiner replied in no uncertain terms, "Yes, they're still allowable."

Counsel then asked Examiner Langel whether he was prepared to immediately allow the claims and issue Applicant his patents in those applications assigned to him, as is customary during an Interview, to which the Examiner replied, "Fine with me."

Specialist McGinty, however, expressed uneasiness over Examiner Langel's agreement to allow claims at the Interview. Specifically, he stated his concern that even if Applicant's claimed technology were found to be operable, there were still issues of novelty and nonobviousness to be addressed before a patent could be issued.

Counsel was surprised by that statement given the PTO's arguments over the prior three years that Applicant's inventions were inoperable based on an incorrect assumption that lower-energy hydrogen cannot possibly exist. Counsel pointed out the obvious contradiction in arguing that the Examiners may still need to conduct a prior art search for possible disclosure of Applicant's lower-energy hydrogen technology.

Counsel further noted the PTO's own examination guidelines requiring Examiners to evaluate the operability and utility of a claimed invention together with its novelty and nonobviousness following a complete prior art search. See MPEP § 706.¹⁰⁶ Counsel again turned to Examiner Langel to confirm whether that was his understanding. The Examiner replied that it was and indicated that, in fact, the first thing he did was to conduct a thorough prior art search because he thought that might be the easiest way to dispose of the applications assigned to him. Examiner Langel explained, however, that he was unable to reject the applications on prior art grounds, which was why he originally allowed them.

Counsel acknowledged Specialist McGinty's hesitation to issue Applicant patents covering his claims at the Interview and assured him that Applicant wanted to work with him to remove any lingering concerns. Counsel then specifically asked Specialist

¹⁰⁶ MPEP § 706 provides in pertinent part:

After the application has been read and the claimed invention understood, a prior art search for the claimed invention is made. With the results of the prior art search, including any references provided by the applicant, the patent application should be reviewed and analyzed in conjunction with the state of the prior art to determine whether the claims define a useful, novel, nonobvious, and enabled invention that has been clearly described in the specification. The goal of examination is to clearly articulate any rejection early in the prosecution process so that the applicant has the opportunity to provide evidence of patentability and otherwise reply completely at the earliest opportunity.

McGinty to articulate how they might proceed in trying to accomplish that mutually beneficial goal. In response, Specialist McGinty indicated that, in the next Response to the pending Office Actions, Applicant should focus on identifying the scientific data generated by independent third-party testing, as opposed to test data generated solely by Applicant. Counsel agreed to do that.

Specialist McGinty further expressed concern over whether that scientific data, even if assumed to be reliable, was commensurate with the scope of the claims of the various applications to adequately support patentability. Counsel stated that Applicant's data did adequately support the claimed subject matter. Counsel, however, recommended reviewing the claims of each application one by one with the assigned Examiners to see if at least some agreement could be reached as to those claims that are adequately supported and for which patents can be issued. As for any remaining claims that the Examiners believe are not adequately supported by the scientific data, Applicant would be free to seek such broader claim coverage through continued prosecution.

Specialist McGinty agreed that this was a reasonable way to proceed and granted a request by counsel, Mr. Simenauer, that this agreement be memorialized in writing in an attachment to the Interview Summary Form. Mr. Simenauer offered to draft this agreement, as is common practice, and Specialist McGinty enthusiastically accepted the offer. Mr. Simenauer then drafted the following Attachment as Specialist McGinty looked on:

ATTACHMENT TO INTERVIEW SUMMARY FORM

Applicant requested that the following points discussed at the Interview held on February 11, 2003 be included as an Attachment to the Interview Summary Form.

Applicant's counsel and the Examiners in attendance at the Interview agreed to meet again at a future date, either in person or by telephone, to continue discussions regarding the patentability of Applicant's pending patent applications. Specifically, the Examiners expressed concern that Applicant's experimental evidence be commensurate with the scope of the claims. To address that concern, Applicant's counsel agreed with the Examiners to go

through the patent applications claim-by-claim with the Examiners and demonstrate how the scientific data supports those claims.

For those claims that are supported by the data, the PTO agrees to issue those claims. For those claims that the PTO determines are not supported by the data, Applicant will continue to seek that broader claim coverage in subsequent proceedings. [Attachment F]

After completing the two-page handwritten Attachment, Mr. Simenauer read it out loud in the presence of Specialist McGinty and Examiner Langel so that they could confirm its accuracy and make any necessary changes. When asked by counsel whether they were satisfied with the wording of the Attachment, Specialist McGinty stated that he was, as did Examiner Langel, who then signed each of the two pages. There was absolutely no confusion as to the agreement to issue patents for those claims found to be supported by the scientific data.

Incredibly, in a transparent attempt to rewrite history, some unknown PTO official apparently instructed Examiner Langel to sign a subsequent communication mailed over two weeks later, on February 26, 2003, that included an attached "Supplement to Interview Summary" (Attachment F), which provides in pertinent part:

The following is a supplement to the summary concerning the February 11, 2003 interview re 09/501,622, etc. . . . A two-page Interview Summary was provided by Examiner Langel. A two page "Attachment to Interview Summary Form" also was provided by Mr. Simenauer. While the Attachment may represent the applicant's understanding of the interview, two points must be clarified.

First the second page of the applicant's attachment states in part: "for those claims that are supported by the data, the PTO agrees to issue those claims." The PTO made no such agreement. Instead, the PTO representatives indicated that the rejections under both 35 USC 101 and 112, 1st para., are outstanding and that evidence as to verification by credible, established, independent third parties would carry more persuasive weight.

Second, QAS Douglas McGinty was not listed in the Examiner's Interview Summary. He was present during the interview with the aforementioned attendees.

[signed] Wayne Langel
Primary Examiner

Art unit 1754

If PTO officials wanted to retract one of the key agreements reached at the Interview, they should have expressly said so, identifying who made the decision and giving reasons for the retraction. Since this was not done, Applicant has no choice but to rely on the accuracy of the contemporaneous written record.

Moreover, in view of other agreements reached at the Interview, the suggestion that there was no agreement to issue patents under the stated conditions is absurd—though hardly surprising given the sordid prosecution history of BlackLight's patent applications. Specialist McGinty plainly stated on the record that the Examiners who signed the outstanding rejections have full authority to review the data and to issue Applicant his patents. Also of record is Examiner Langel's unequivocal statement that, based on his review, he was prepared to issue those patents. To then force this same Examiner to sign a statement two weeks after the fact denying that "for those claims that are supported by the data, the PTO agrees to issue those claims" is, frankly, embarrassing.

Other ineffective arguments, such as those made by Examiner Kalafut in his Advisory Action dated April 2, 2003 filed in U.S. Serial No. 08/467,911, that "the present Examiner did not commit to any agreements during the interview" are also disappointing and, hopefully, will not be repeated. Applicant acknowledges that, to the best of his recollection, Examiner Kalafut, although present at the February 11 Interview, did not speak a word. As previously indicated, it was Specialist McGinty who led the Interview on behalf of the PTO and it was he who ultimately agreed to the terms under which examination of BlackLight's patent applications would proceed, which terms were expressly reduced to writing. For Examiner Kalafut, or any other Examiner assigned to one of BlackLight's applications, to now attempt to distance themselves from that agreement based on the weak assertion that they did not personally commit to it during the Interview merely illustrates yet another example of the PTO's arbitrary and capricious approach to examining these applications.

Applicant's Identification of Scientific Data Supporting Lower energy States of Hydrogen Generated and Furnished By Independent Third-Parties

In light of the controversial prosecution history of this and other pending BlackLight cases, Applicant appreciated what seemed to be Specialist McGinty's willingness to set reasonable standards and guidelines by which Applicant's patents could finally be issued. Applicant acknowledged and documented Specialist McGinty's concern over the reliability of the record evidence, which led to his requirement that Applicant identify independent third-party verification of the scientific data as noted in the Supplemental Interview Summary. With those standards and guidelines in mind, Applicant presented in copending applications a summary of the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties, which is reproduced below along with additional, newly submitted data.¹⁰⁷

Experimental Evidence Generated by Independent Third Parties

Applicant is unaware of any statutes, rules, or case law requiring that experimental evidence submitted by an Applicant in response to a rejection by the PTO be generated by independent third parties. Despite the higher standard imposed by Specialist McGinty requiring such third-party validation of the evidence, Applicant still has met and far exceeded this standard as shown below.

Applicant provides the following alphabetical list of independent third-party laboratories and universities that conducted the experiments and generated the scientific data relied upon and discussed in the 47 analytical studies that follow this list:

Advanced Research - Pirelli Labs, Milan, Italy

Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base

Atomic Energy Canada Limited, Chalk River Laboratories

Brookhaven National Laboratory

Charles Evans & Associates, Sunnyvale, CA

¹⁰⁷ See, for example, U.S. Serial Nos. 09/110,678 and 09/362,693.

Charles Evans East, East Windsor, NJ

Environmental Catalysis and Materials Laboratory of Virginia Polytechnic Institute

Franklin and Marshall College

Galbraith Laboratories, Inc., Knoxville, TN

Grace Davison, Columbia, MD

IC Laboratories, Amawalk, NY

Idaho National Engineering Laboratory

Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany)

Jobin Yvon Inc., Edison, NJ

Laboratory for Electrochemistry of Renewed Electrode-Solution Interface
(LEPGER)

Liebert Corporation, Division of Emerson Corporation

Los Alamos National Laboratory

Material Testing Laboratory, Pennington, NJ

MIT Lincoln Laboratories

Moscow Power Engineering Institute

NASA Lewis

National Research Council of Canada

PacifiCorp

Pennsylvania State University Chemical Engineering Department

Perkin-Elmer Biosystems, Framingham, MA

Pirelli Labs, Milan, Italy

Ricerca, Inc., Painesville, Ohio

Rider University, Lawrenceville NJ

Rowan University Professors A. J. Marchese, P. M. Jansson, J. L. Schmalzel

Ruhr University, Bochum, Germany

Shrader Analytical & Consulting Laboratories

Spectral Data Services, Inc., Champaign, IL

S. S. W., University of Western Ontario, Canada

Surface Science Laboratories, Mountain View, CA

Thermacore, Inc., Lancaster, PA

University of Delaware, Wilmington, DE

University of Massachusetts Amherst, Amherst, MA

University of New Mexico

Westinghouse Electric Corporation

Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University,
Bethlehem, PA

The following 47 abstracts briefly describe the analytical studies of the scientific data generated by these independent third parties (highlighted in underline).

Independent Test Results

- 47. R. L. Mills, P. Ray, M. Nansteel, J. He, X. Chen, A. Voigt, B. Dhandapani, Luca Gamberale, "Energetic Catalyst-Hydrogen Plasma Reaction as a Potential New Energy Source", European Physical Journal D, submitted.**

Luca Gamberale of the Advanced Research - Pirelli Labs, Milan, Italy performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of a chemically generated hydrogen plasma, extraordinarily broadened atomic hydrogen lines, lower-energy atomic, molecular, and molecular-ion hydrogen lines, the isolation and characterization of lower-energy molecular

hydrogen gas, and excess power measured by water bath calorimetry were replicated. Specifically, plasmas of certain catalysts such as Sr^+ , Ar^+ , Ne^+ , and He^+ mixed with hydrogen were studied for evidence of a novel energetic reaction. A hydrogen plasma was observed to form at low temperatures (e.g. $\approx 10^3 K$) and an extraordinary low field strength of about 1-2 V/cm when argon and strontium were present with atomic hydrogen. RF and microwave plasmas were used to generate He^+ , Ne^+ , and Ar^+ catalysts. Extraordinarily fast H (40-50 eV) was observed by Balmer α line broadening only from plasmas having a catalyst with H. Novel extreme ultraviolet (EUV) emission lines were observed that corresponded to a Rydberg series of H corresponding to fractional principal quantum numbers wherein $n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}$; ($p \leq 137$ is an integer) replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. Corresponding emission due to fraction-principal-quantum-level hydrogen molecular ion $H_2^+(1/p)$ and molecular hydrogen $H_2(1/p)$ were also observed. $H_2(1/p)$ gas was isolated by liquefaction using an high-vacuum (10^{-6} Torr) capable, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), visible and EUV optical emission spectroscopy (OES), and 1H NMR of the condensable gas dissolved in $CDCl_3$ performed at Rider University, Lawrenceville NJ. Novel peaks were observed by cryogenic gas chromatography performed on the condensable gas which was highly pure hydrogen by MS and had a higher ionization energy than H_2 . A unique EUV emission spectrum was observed by OES. The observation that the novel EUV emission spectrum shifted with deuterium substitution in a region where no hydrogen emission has ever been observed strongly supported the existence of lower-energy molecular hydrogen. Contaminants and exotic helium-hydrogen species were eliminated as the source of the reaction and condensed gas plasma emission spectra. Upfield shifted NMR peaks were observed at 3.22, 3.25, and 3.47 ppm compared to that of H_2 at 4.63 ppm. Excess power was absolutely measured from the helium-hydrogen plasma. For an input of 44.3 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 62.9 W corresponding to 18.6 W of excess power in $3 cm^3$. The excess power density and energy balance were high, $6.2 W/cm^3$ and $-5 \times 10^4 kJ/mole H_2$ ($240 eV/H atom$), respectively.

46. R. Mills, B. Dhandapani, M. Nansteel, J. He, P. Ray, "Liquid-Nitrogen-Condensable Molecular Hydrogen Gas Isolated from a Catalytic Plasma Reaction", J. Phys. Chem. B, submitted.

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 4, 6, 7, 8, 9, 11$ or these discrete energies less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $\text{He}(1s^2)$ to $\text{He}(1s^1 2p^1)$. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen, formed by a resonant nonradiative energy transfer to He^+ . Corresponding emission due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at $E_{D+vib} = p^2 E_{D H_2} \pm \left(\frac{\nu^*}{3}\right) E_{vib H_2(\nu=0 \rightarrow \nu=1)}$, $\nu^* = 1, 2, 3 \dots$ was observed at the longer wavelengths for $\nu^* = 2$ to $\nu^* = 32$ and at the shorter wavelengths for $\nu^* = 1$ to $\nu^* = 16$ where $E_{D H_2}$ and $E_{vib H_2(\nu=0 \rightarrow \nu=1)}$ are the experimental bond and vibrational energies of H_2 , respectively. Fraction-principal-quantum-level molecular hydrogen $H_2(1/p)$ gas was isolated by liquefaction using an high-vacuum (10^{-6} torr) capable, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), visible and EUV optical emission spectroscopy (OES), and 1H NMR of the condensable gas dissolved in $CDCl_3$ performed at Rider University, Lawrenceville NJ. Novel peaks were observed by cryogenic gas chromatography performed on the condensable gas which was highly pure hydrogen by MS and had a higher ionization energy than H_2 . A unique EUV emission spectrum was observed by OES. The observation that the novel EUV emission spectrum shifted with deuterium substitution in a region where no hydrogen emission has ever been observed unequivocally confirmed the existence of lower-energy molecular hydrogen. Contaminants and exotic helium-hydrogen species were eliminated as the source of the reaction and condensed gas plasma emission spectra. Upfield shifted NMR peaks were observed at 3.22 and 3.47 ppm compared to that of H_2 at 4.63 ppm. A theoretical rocketry propellant reaction is given that may be transformational.

45. **Dr. K.D. Keefer, Report on BlackLight Power Technology: Its Apparent Scientific Basis, State of Development and Stability for Commercialization by Liebert Corporation, (2001), and, Report on BlackLight Power Technology: Its Apparent Scientific Basis, State of Development and Stability for Commercialization, (2002).**

To separate reports disclosing the results of NMR, ToF-SIMS, XPS identification of novel hydrido hydride compounds and analysis of chemically-produced plasma by an expert hired by the Liebert Corporation, a division of the well-known and highly-respected Emerson Corporation. According to the expert's own words, he "observed demonstrations of the BlackLight Power (BLP) process and ...reached the inescapable conclusion that it is based on extraordinary chemical reactions that seem to release extraordinary amounts of energy....

It is [his] professional opinion that the BLP process represents a chemical conversion of atomic hydrogen unlike any previously reported [in] the archival scientific literature." Although the expert states that he was skeptical of Applicant's theory, he admitted that the chemical and plasma data did support Applicant's fractional quantum states and that he could offer no other explanation of the data using conventional quantum theory.

44. A. J. Marchese, P. M. Jansson, J. L. Schmalzel, "The BlackLight Rocket Engine", Phase I Final Report, NASA Institute for Advanced Concepts Phase I, May 1-November 30, 2002,

http://www.niac.usra.edu/files/studies/final_report/pdf/752Marchese.pdf.

Rowan University Professors A. J. Marchese, P. M. Jansson, J. L. Schmalzel

performed verification studies as visiting researchers at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of extraordinarily broadened atomic hydrogen lines, population inversion, lower-energy hydrogen lines, and excess power measured by water bath calorimetry were replicated. The application of the energetic hydrogen to propulsion was studied.

Specifically, the data supporting hydrinos was replicated. See

i.) BlackLight Process Theory (pp. 10-12) which gives the theoretical energy levels for hydrinos and the catalytic reaction to form hydrinos,

ii.) Unique Hydrogen Line Broadening in Low Pressure Microwave Water Plasmas (pp. 25-27, particularly Fig. 21) which shows that in the same microwave cavity driven at the same power, the temperature of the hydrogen atoms in the microwave plasma where the hydrino reaction was active was 50 times that of the control based on the spectroscopic line widths,

iii.) Inversion of the Line Intensities in Hydrogen Balmer Series (pp. 27-28, particularly Fig. 22) which shows for the first time in 40 years of intensive worldwide research that atomic hydrogen population inversion was achieved in a steady state plasma and supports the high power released from the reaction of hydrogen to form hydrinos,

iv.) Novel Vacuum Ultraviolet (VUV) Vibration Spectra of Hydrogen Mixture Plasmas (pp. 28-29, particularly Fig. 23) which shows a novel vibrational series of lines in a helium-hydrogen plasmas at energies higher than any known vibrational series and it identically matches the theoretical prediction of 2 squared times the corresponding vibration of the ordinary hydrogen species, and

v.) Water Bath Calorimetry Experiments Showing Increased Heat Generation (pp. 29-30, particularly Fig. 25) that shows that with exactly the same system and same input power,

the heating of the water reservoir absolutely measured to 1% accuracy was equivalent to 55 to 62 W with the catalyst-hydrogen mixture compared to 40 W in the control without the possibility of the reaction to form hydrinos.

43. J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", Journal of Applied Physics, submitted.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. Water bath calorimetry was used to demonstrate one more peculiar phenomenon associated with a certain class of mixed gas plasmas termed resonant transfer, or rt-plasmas. Specifically, He/H_2 (10%) (500 mTorr), Ar/H_2 (10%) (500 mTorr), and $H_2O(g)$ (200 mTorr) plasmas generated with an Evenson microwave cavity consistently yielded on the order of 50% more heat than non rt-plasma (controls) such as He , Kr , Kr/H_2 (10%), under identical conditions of gas flow, pressure, and microwave operating conditions. The excess power density of rt-plasmas was of the order $10\text{ W}\cdot\text{cm}^{-3}$. In earlier studies with these same rt-plasmas it was demonstrated that other unusual features were present including dramatic broadening of the hydrogen Balmer series lines, unique vacuum ultraviolet (VUV) lines, and in the case of water plasmas, population inversion of the hydrogen excited states. Both the current results and the earlier results are completely consistent with the existence of a hitherto unknown exothermic chemical reaction, such as that predicted by Mills, occurring in rt-plasmas.

42. R. L. Mills, P. C. Ray, R. M. Mayo, M. Nansteel, B. Dhandapani, J. Phillips, "Spectroscopic Study of Unique Line Broadening and Inversion in Low Pressure Microwave Generated Water Plasmas", Physics of Plasmas, submitted.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. It was demonstrated that low pressure (~ 0.2 Torr) water vapor plasmas generated in a 10 mm ID quartz tube with an Evenson microwave cavity show at least two features which are not explained by conventional plasma models. First, significant ($> 2.5\text{ \AA}$) hydrogen Balmer α line broadening was recorded, of constant width, up to 5 cm from the microwave coupler. Only hydrogen, and not oxygen, showed significant line broadening. This feature, observed previously in hydrogen-containing mixed gas plasmas generated with high voltage DC and RF discharges was explained by some researchers to result from acceleration of hydrogen ions near the cathode. This explanation

cannot apply to the line broadening observed in the (electrodeless) microwave plasmas generated in this work, particularly at distances as great as 5 cm from the microwave coupler. Second, dramatic inversion of the line intensities of both the Lyman and Balmer series, again, at distances up to 5 cm from the coupler were observed. The dramatic line inversion suggests the existence of a hitherto unknown source of pumping of the optical power in plasmas. Finally, it is notable that other aspects of the plasma including the OH^* rotational temperature and low electron concentrations are quite typical of plasmas of this type.

41. H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from a Plasma Formed by Incandescently Heating Hydrogen Gas with Trace Amounts of Potassium Carbonate", Plasma Sources Science and Technology, Vol. 12, (2003), pp. 389-395.

The generation of a hydrogen plasma with intense extreme ultraviolet and visible emission was observed at Ruhr University, Bochum, Germany from low pressure hydrogen gas (0.1-1 mbar) in contact with a hot tungsten filament only when the filament heated a titanium dissociator coated with K_2CO_3 above 750°C. The dissociator was electrically floated, and the electric field strength from the filament was about 1 V/cm, two orders of magnitude lower than the starting voltages measured for gas glow discharges. The emission of the H_α and H_β transitions as well as the L_α and L_β transitions were recorded and analyzed. The plasma seemed to be far from thermal equilibrium, and no conventional mechanism was found to explain the formation of a hydrogen plasma by incandescently heating hydrogen gas with the presence of trace amounts of K_2CO_3 . The temporal behavior of the plasma was recorded via hydrogen Balmer alpha line emission when all power into the cell was terminated. A two second decay of the plasma was observed after a fast decay of the electric field to zero. The plasma was found to be dependent on the chemistry of atomic hydrogen with potassium since no plasma formed with Na_2CO_3 replacing K_2CO_3 and the time constant of the emission following the removal of all of the power to the cell matched that of the cooling of the filament and the resulting shift from atomic to molecular hydrogen. Our results indicate that a novel chemical power source is present that forms the energetic hydrogen plasma. The plasma is a potential new light source.

40. R. Mills, "Observation of Extreme Ultraviolet Emission from Hydrogen-KI Plasmas Produced by a Hollow Cathode Discharge", Int. J. Hydrogen Energy, Vol. 26, No. 6, (2001), pp. 579-592.

A high voltage discharge of hydrogen with and without the presence of a source of potassium, potassium iodide, in the discharge was performed at Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany) with a hollow cathode. It has been reported that intense extreme ultraviolet (EUV) emission was observed at low temperatures (e.g. $< 10^3$ K) from atomic hydrogen and certain atomized elements or certain gaseous ions which ionize at integer multiples of the potential energy of atomic hydrogen, 27.2 eV [1, 3-5]. Two potassium ions or a potassium atom may each provide an electron ionization or transfer reaction that has a net enthalpy equal to an integer multiple of 27.2 eV. The spectral lines of atomic hydrogen were intense enough to be recorded on photographic films only when KI was present. EUV lines not assignable to potassium, iodine, or hydrogen were observed at 73.0, 132.6, 513.6, 677.8, 885.9, and 1032.9 Å. The lines are assigned to transitions of atomic hydrogen to lower energy levels corresponding to lower energy hydrogen atoms called hydrino atoms and the emission from the excitation of the corresponding hydride ions formed from the hydrino atoms.

39. R. Mills, "Temporal Behavior of Light-Emission in the Visible Spectral Range from a Ti-K₂CO₃-H-Cell", Int. J. Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 327-332.

Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany) reports the generation of a hydrogen plasma and extreme ultraviolet emission as recorded via the hydrogen Balmer emission in the visible range. Typically a hydrogen plasma is generated and the emission of extreme ultraviolet light from hydrogen gas is achieved via a discharge at high voltage, a high power inductively coupled plasma, or a plasma created and heated to extreme temperatures by RF coupling (e.g. $> 10^6$ K) with confinement provided by a toroidal magnetic field. The observed plasma formed at low temperatures (e.g. $\approx 10^3$ K) from atomic hydrogen generated at a tungsten filament that heated a titanium dissociator coated with potassium carbonate. The temporal behavior of the plasma was recorded via hydrogen Balmer alpha line emission when all power into the cell was terminated. A two second decay of the plasma was observed after a fast decay of the electric field to zero. The persistence of emission following the removal of all of the power to the cell indicates that a novel chemical power source is present that forms an energetic plasma in hydrogen. No unusual behavior was observed with the control sodium carbonate.

38. R. Mills, J. Sankar, P. Ray, J. He, A. Voigt, B. Dhandapani, "Synthesis and Characterization of Diamond Films from MPCVD of an Energetic Argon-Hydrogen Plasma and Methane ", J. of Materials Research, submitted.

Polycrystalline diamond films were synthesized on silicon substrates by a low power (~80 W) microwave plasma chemical vapor deposition (MPCVD) reaction of a mixture of argon-hydrogen-methane (17.5/80/2.5%). The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA), scanning electron microscopy (SEM) (S. S. W., University of Western Ontario, Canada), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that Ar^+ served as a catalyst with atomic hydrogen to form an energetic plasma. CH , C_2 , and C_3 emissions were observed with significantly broadened H α line. The average hydrogen atom temperature of a argon-hydrogen plasma was measured to be 110–130 eV versus ≈ 3 eV for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

37. R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", J. Phys. Chem. A, submitted.

$2K^+$ to $K + K^{2+}$ and K to K^{3+} provide a reaction with a net enthalpy equal to the one and three times the potential energy of atomic hydrogen, respectively. The presence of these gaseous ions or atoms with thermally dissociated hydrogen formed a so-called resonance transfer (rt) plasma having strong VUV emission with a stationary inverted Lyman population. Significant line broadening of the Balmer α , β , and γ lines of 18 eV was observed, compared to 3 eV from a hydrogen microwave plasma. Emission from rt-plasmas occurred even when the electric field applied to the plasma was zero as recorded at Institut für Niedertemperatur-Plasmaphysik e.V. (INP Greifswald, Germany). The reaction was exothermic since excess power of $20 \text{ mW} \cdot \text{cm}^{-3}$ was measured by Calvet calorimetry. An energetic catalytic reaction was proposed involving a resonant energy transfer between hydrogen atoms and $2K^+$ or K to form very stable novel hydride ions $H^-(1/p)$ called hydrino hydrides having a fractional principal quantum numbers $p = 2$ and $p = 4$, respectively. Characteristic emission was observed from K^{2+} and K^{3+} that confirmed the resonant

nonradiative energy transfer of 27.2 eV and 3·27.2 eV from atomic hydrogen to 2K⁺ and K, respectively.

The predicted binding energy of H⁻(1/2) of 3.0471 eV with the fine structure was observed at 4071 Å, and its predicted bound-free hyperfine structure lines $E_{HF} = j^2 3.00213 \times 10^{-5} + 3.0563 \text{ eV}$ (j is an integer) matched those observed for $j = 1$ to $j = 37$ to within a 1 part per 10⁴. H⁻(1/4) was observed spectroscopically at 110 nm corresponding to its predicted binding energy of 11.2 eV. The ¹H MAS NMR spectrum (Spectral Data Services, Inc., Champaign, IL) of novel compound KH*Cl relative to external tetramethylsilane (TMS) showed a large distinct upfield resonance at -4.4 corresponding to an absolute resonance shift of -35.9 ppm that matched the theoretical prediction of $p = 4$. A novel NMR (Grace Davison, Columbia, MD and Spectral Data Services, Inc., Champaign, IL) peak of KH*I at -1.5 ppm relative to TMS corresponding to an absolute resonance shift of -33.0 ppm matched the theoretical prediction of $p = 2$. The predicted catalyst reactions, position of the upfield-shifted NMR peaks, and spectroscopic data for H⁻(1/2) and H⁻(1/4) were found to be in agreement.

36. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Novel Liquid-Nitrogen-Condensable Molecular Hydrogen Gas", Polish Journal of Chemistry, submitted.

Extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 4, 6, 7, 8, 9, 11$ or these discrete energies less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of He(1s²) to He(1s¹2p¹). These lines matched H(1/ p), fractional Rydberg states of atomic hydrogen, formed by a resonant nonradiative energy transfer to He⁺. Corresponding emission due to the reaction $2H(1/2) \rightarrow H_2(1/2)$ with vibronic coupling at $E_{D+vib} = p^2 E_{D H_2} \pm \left(\frac{\nu^*}{3}\right) E_{vib H_2(\nu=0 \rightarrow \nu=1)}$, $\nu^* = 1, 2, 3, \dots$ was observed at the longer wavelengths for $\nu^* = 2$ to $\nu^* = 32$ and at the shorter wavelengths for $\nu^* = 1$ to $\nu^* = 16$ where $E_{D H_2}$ and $E_{vib H_2(\nu=0 \rightarrow \nu=1)}$ are the experimental bond and vibrational energies of H₂, respectively. Fractional-principal-quantum-level molecular hydrogen H₂(1/ p) gas was isolated by liquefaction using an ultrahigh-vacuum, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), optical emission spectroscopy (OES), and ¹H NMR (Rider University, Lawrenceville NJ) of the condensable gas dissolved in CDCl₃. The condensable gas was highly pure hydrogen by GC and MS and had a higher ionization energy than H₂. An upfield shifted NMR peak was

observed at 3.25 ppm compared to that of H_2 at 4.63 ppm. A theoretical rocketry propellant reaction is given that may be transformational.

35. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Spectroscopic Characterization of the Atomic Hydrogen Energies and Densities and Carbon Species During Helium-Hydrogen-Methane Plasma CVD Synthesis of Single Crystal Diamond Films", Chemistry of Materials, Vol. 15, (2003), pp. 1313-1321.

Polycrystalline diamond films were synthesized on silicon substrates for the first time without diamond seeding by a very low power (38 W) microwave plasma continuous vapor deposition (MPCVD) reaction of a mixture of helium-hydrogen-methane (48.2/48.2/3.6%). The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA and Jobin Yvon Inc., Edison, NJ), scanning electron microscopy (SEM) (S. S. W., University of Western Ontario, Canada and Material Testing Laboratory, Pennington, NJ), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. CH , C_2 , and C_3 emissions were observed with significantly broadened $H \alpha$, β , γ , and δ lines. The average hydrogen atom temperature of a helium-hydrogen-methane plasma was measured to be 120 - 140 eV versus ≈ 3 eV for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

34. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Low Power MPCVD of Diamond Films on Silicon Substrates", Journal of Vacuum Science & Technology A, submitted.

Polycrystalline diamond films were synthesized on silicon substrates for the first time without diamond seeding by a very low power (38 W) microwave plasma continuous vapor deposition (MPCVD) reaction of a mixture of 10-30% hydrogen, 90-70% helium, and 1-10% CH_4 . The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA), scanning electron microscopy (SEM) (S. S. W., University of

Western Ontario, Canada and Material Testing Laboratory, Pennington, NJ), and X-ray diffraction (XRD) (IC Laboratories, Amawalk, NY). It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. The average hydrogen atom temperature was measured to be 180 - 210 eV versus ≈ 3 eV for pure hydrogen. The electron temperature T_e for helium-hydrogen was 28,000 K compared to 6800 K for pure helium. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of diamond. Then, by this novel pathway, the relevance of the CO tie line is eliminated along with other stringent conditions and complicated and inefficient techniques which limit broad application of the versatility and superiority of diamond thin film technology.

33. R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Spectroscopic Identification of Lithium Chloro Hydride", Materials Characterization, submitted.

A novel inorganic hydride compound, lithium chloro hydride ($LiHCl$), which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and lithium chloride. Lithium chloro hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), 1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and powder X-ray diffraction (IC Laboratories, Amawalk, NY). Hydride ions with increased binding energies may form many novel compounds with broad applications such as the oxidant of a high voltage battery.

32. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, in press.

A novel highly stable hydrogen terminated silicon coating was synthesized by microwave plasma reaction of mixture of silane, hydrogen, and helium wherein it is proposed that He^+ served as a catalyst with atomic hydrogen to form highly stable silicon hydrides. Novel silicon hydride was identified by time of flight secondary ion mass spectroscopy and X-ray photoelectron spectroscopy. The time of flight secondary ion mass spectroscopy (ToF-SIMS) identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. Since hydrogen is the only element with no primary element peaks, X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) identified the H content of the SiH coatings as comprising novel silicon hydrides due to new peaks at 11, 43,

and 55 eV in the absence of corresponding peaks of any candidate element at higher binding energies. The silicon hydride surface was remarkably stable to air as shown by XPS. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

31. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Synthesis of HDLC Films from Solid Carbon", Thin Solid Films, submitted.

Diamond-like carbon (DLC) films were synthesized on silicon substrates from solid carbon by a very low power (~60 W) microwave plasma chemical vapor deposition (MPCVD) reaction of a mixture of 90-70% helium and 10-30% hydrogen. It is proposed that He^+ served as a catalyst with atomic hydrogen to form an energetic plasma. The average hydrogen atom temperature of a helium-hydrogen plasma was measured to be 180-210 eV versus ≈ 3 eV for pure hydrogen. Bombardment of the carbon surface by highly energetic hydrogen formed by the catalysis reaction may play a role in the formation of DLC. The films were characterized by time of flight secondary ion mass spectroscopy (ToF-SIMS), X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), and Raman spectroscopy (Charles Evans & Associates, Sunnyvale, CA). TOF-SIMS identified the coatings as hydride by the large H^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. The XPS identification of the H content of the CH coatings as a novel hydride corresponding to a peak at 49 eV has implications that the mechanism of the DLC formation may also involve one or both of selective etching of graphitic carbon and the stabilization of sp^3 -bonded carbon by the hydrogen catalysis product. Thus, a novel H intermediate formed by the plasma catalysis reaction may enhance the stabilization and etching role of H used in past methods.

30. R. L. Mills, J. He, P. Ray, B. Dhandapani, X. Chen, "Synthesis and Characterization of a Highly Stable Amorphous Silicon Hydride as the Product of a Catalytic Helium-Hydrogen Plasma Reaction", Int. J. Hydrogen Energy, in press.

A novel highly stable surface coating $SiH(1/p)$ which comprised high binding energy hydride ions was synthesized by a microwave plasma reaction of a mixture of silane, hydrogen, and helium wherein it is proposed that He^+ served as a catalyst with atomic hydrogen to form the highly stable hydride ions. Novel silicon hydride was identified by time of flight secondary ion mass spectroscopy and X-ray photoelectron spectroscopy. The time

of flight secondary ion mass spectroscopy (ToF-SIMS) identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) identified the H content of the SiH coatings as hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively. The silicon hydride surface was remarkably stable to air as shown by XPS. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

The plasma which formed $SiH(1/p)$ showed a number of extraordinary features. Novel emission lines with energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 4, 6, 7, 8, 9$, or 11 were previously observed by extreme ultraviolet (EUV) spectroscopy recorded on microwave discharges of helium with 2% hydrogen [R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322]. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen where p is an integer, formed by a resonant nonradiative energy transfer to He^+ acting as a catalyst. The average hydrogen atom temperature of the helium-hydrogen plasma was measured to be 180-210 eV versus $\approx 3 \text{ eV}$ for pure hydrogen. Using water bath calorimetry, excess power was observed from the helium-hydrogen plasma compared to control krypton plasma. For example, for an input of 8.1 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 30.0 W corresponding to 21.9 W of excess power in 3 cm^3 . The excess power density and energy balance were high, 7.3 W/cm^3 and $-2.9 \times 10^4 \text{ kJ/mole } H_2$, respectively. This catalytic plasma reaction may represent a new hydrogen energy source and a new field of hydrogen chemistry.

29. R. L. Mills, A. Voigt, B. Dhandapani, J. He, "Synthesis and Characterization of Lithium Chloro Hydride", Int. J. Hydrogen Energy, submitted.

A novel inorganic hydride compound lithium chloro hydride, $LiHCl$, which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and lithium chloride. Lithium chloro hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), 1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and powder X-ray diffraction (IC Laboratories, Amawalk, NY). Hydride ions with increased

binding energies may form many novel compounds with broad applications such as the oxidant of a high voltage battery.

28. R. Mills, E. Dayalan, P. Ray, B. Dhandapani, J. He, "Highly Stable Novel Inorganic Hydrides from Aqueous Electrolysis and Plasma Electrolysis", *Electrochimica Acta*, Vol. 47, No. 24, (2002), pp. 3909-3926.

After 10^4 hours of continuous aqueous electrolysis with K_2CO_3 as the electrolyte, highly stable novel inorganic hydride compounds such as KH and $KHCO_3$ were isolated and identified by time of flight secondary ion mass spectroscopy (ToF-SIMS) (Charles Evans East, East Windsor, NJ). The existence of novel hydride ions was determined using X-ray photoelectron spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA) and solid state magic-angle spinning 1H nuclear magnetic resonance spectroscopy (1H MAS NMR) (Spectral Data Services, Inc., Champaign, IL). A novel ion formed by plasma electrolysis of a K_2CO_3 , Rb_2CO_3 , or Cs_2CO_3 electrolyte was also observed by high resolution visible spectroscopy at 407.0 nm corresponding to its predicted binding energy of 3.05 eV.

27. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", *Int. J. Hydrogen Energy*, Vol. 26, No. 9, Sept. (2001), pp. 965-979.

Novel inorganic alkali and alkaline earth hydrides of the formula MH^* , MH_2^* , and MH^*X wherein M is the metal, X , is a halide, and H^* comprises a novel high binding energy hydride ion were synthesized in a high temperature gas cell by reaction of atomic hydrogen with a catalyst and MH , MH_2 , or MX corresponding to an alkali metal or alkaline earth metal compound, respectively. Novel hydride ions of the corresponding novel hydride compounds were characterized by an extraordinary upfield shifted peak observed by 1H nuclear magnetic resonance spectroscopy. The result were confirmed on five different instruments at five independent laboratories (Spectral Data Services, Inc., Champaign, IL, National Research Council of Canada, University of Massachusetts Amherst, Amherst, MA, University of Delaware, Wilmington, DE, and Grace Davison, Columbia, MD).

26. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.

A novel inorganic hydride compound KHI which comprises a high binding energy hydride ion was synthesized by reaction of atomic hydrogen with potassium metal and potassium iodide. Potassium iodo hydride was identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), 1H and ^{39}K nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), Fourier transform infrared spectroscopy (Surface Science Laboratories, Mountain View, CA), electrospray ionization time of flight mass spectroscopy (Perkin-Elmer Biosystems, Framingham, MA), liquid chromatography/mass spectroscopy (Ricerca, Inc., Painesville, Ohio), thermal decomposition with analysis by gas chromatography, and mass spectroscopy, and elemental analysis (Galbraith Laboratories, Inc., Knoxville, TN). Hydride ions with increased binding energies may form many novel compounds with broad applications.

25. R. Mills, "Novel Inorganic Hydride", Int. J. of Hydrogen Energy, Vol. 25, (2000), pp. 669-683.

A novel inorganic hydride compound $KHKHCO_3$ which is stable in water and comprises a high binding energy hydride ion was isolated following the electrolysis of a K_2CO_3 electrolyte. Inorganic hydride clusters $K[KHKHCO_3]^+$ were identified by Time of Flight Secondary Ion Mass Spectroscopy (Charles Evans East, East Windsor, NJ). Moreover, the existence of a novel hydride ion has been determined using X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), and 1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL). Hydride ions with increased binding energies may be the basis of a high voltage battery for electric vehicles.

24. R. Mills, B. Dhandapani, M. Nansteel, J. He, T. Shannon, A. Echezuria, "Synthesis and Characterization of Novel Hydride Compounds", Int. J. of Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 339-367.

Novel inorganic alkali and alkaline earth hydrides of the formula MHX and $MHMX$ wherein M is the metal, X , is a singly negatively charged anion, and H comprises a novel high binding energy hydride ion were synthesized in a high temperature gas cell by reaction of atomic hydrogen with a catalyst and MX or MX_2 corresponding to an alkali metal or alkaline earth metal, respectively. It has been reported that intense extreme ultraviolet (EUV) emission was observed at low temperatures (e.g. $\approx 10^3 K$) from atomic hydrogen and certain atomized elements or certain gaseous ions which ionize at integer multiples of the potential

energy of atomic hydrogen, 27.2 eV [1-5]. These atomized elements or certain gaseous ions comprised the catalyst to form MHX and $MHMX$. For example, atomic hydrogen was reacted with strontium vapor and $SrBr_2$ to form $SrHBr$. Novel hydride compounds such as $SrHBr$ were identified by time of flight secondary ion mass spectroscopy, X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), 1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL), and thermal decomposition with analysis by gas chromatography, and mass spectroscopy. Hydride ions with increased binding energies form novel compounds with potential broad applications such as a high voltage battery for consumer electronics and electric vehicles. In addition, these novel compositions of matter and associated technologies may have far-reaching applications in many industries including chemical, electronics, computer, military, energy, and aerospace in the form of products such as propellants, solid fuels, surface coatings, structural materials, and chemical processes.

23. R. Mills, "Highly Stable Novel Inorganic Hydrides", *Journal of New Materials for Electrochemical Systems*, Vol. 6, (2003), pp. 45-54.

Novel inorganic hydride compounds $KHKHCO_3$ and KH were isolated following the electrolysis of a K_2CO_3 electrolyte. The compounds which comprised high binding energy hydride ions were stable in water, and KH was stable at elevated temperature ($600\text{ }^\circ\text{C}$). Inorganic hydride clusters $K[KHKHCO_3]^+$ were identified by positive Time of Flight Secondary Ion Mass Spectroscopy (ToF-SIMS) of $KHKHCO_3$ (Charles Evans East, East Windsor, NJ). The negative ToF-SIMS was dominated by hydride ion. The positive and negative ToF-SIMS of KH showed essentially K^+ and H^- only, respectively. Moreover, the existence of novel hydride ions was determined using X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), and 1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL). Hydride ions with increased binding energies may be the basis of a high voltage battery for electric vehicles.

22. R. Mills, "Novel Hydrogen Compounds from a Potassium Carbonate Electrolytic Cell", *Fusion Technology*, Vol. 37, No. 2, March, (2000), pp. 157-182.

Novel compounds containing hydrogen in new hydride and polymeric states which demonstrate novel hydrogen chemistry have been isolated following the electrolysis of a K_2CO_3 electrolyte with the production of excess energy. Inorganic hydride clusters $K[KHKHCO_3]^+$ and hydrogen polymer ions such as OH_{23}^+ and H_{16}^- were identified by time of

flight secondary ion mass spectroscopy (Charles Evans East, East Windsor, NJ). The presence of compounds containing new states of hydrogen were confirmed by X-ray photoelectron spectroscopy (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA), X-ray diffraction, Fourier transform infrared spectroscopy (Surface Science Laboratories, Mountain View, CA), Raman spectroscopy (Environmental Catalysis and Materials Laboratory of Virginia Polytechnic Institute), and ^1H nuclear magnetic resonance spectroscopy (Spectral Data Services, Inc., Champaign, IL).

21. Mills, R., Good, W., "Fractional Quantum Energy Levels of Hydrogen", Fusion Technology, Vol. 28, No. 4, November, (1995), pp. 1697-1719.

Determination of excess heat release during the electrolysis of aqueous potassium carbonate by the very accurate and reliable method of heat measurement, flow calorimetry; describes the experimental identification of hydrogen atoms in fractional quantum energy levels—hydrinos—by X-ray Photoelectron Spectroscopy (XPS) (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA); describes the experimental identification of hydrogen atoms in fractional quantum energy levels—hydrinos—by emissions of soft X-rays from dark matter; describes the experimental identification of hydrogen molecules in fractional quantum energy levels—dihydrino molecules by high resolution magnetic sector mass spectroscopy with ionization energy determination, and gives a summary.

In summary:

Excess power and heat were observed during the electrolysis of aqueous potassium carbonate. Flow calorimetry of pulsed current electrolysis of aqueous potassium carbonate at a nickel cathode was performed in a single-cell dewar. The average power out of 24.6 watts exceeded the average input power (voltage times current) of 4.73 watts by a factor greater than 5. The total input energy (integration of voltage times current) over the entire duration of the experiment was 5.72 MJ; whereas, the total output energy was 29.8 MJ. No excess heat was observed when the electrolyte was changed from potassium carbonate to sodium carbonate. The source of heat is assigned to the electrocatalytic, exothermic reaction whereby the electrons of hydrogen atoms are induced to undergo transitions to quantized energy levels below the conventional "ground state". These lower energy states correspond to fractional quantum numbers: $n = 1/2, 1/3, 1/4, \dots$. Transitions to these lower energy states are stimulated in the presence of pairs of potassium ions (K^+/K^+ electrocatalytic couple) which provide 27.2 eV energy sinks.

The identification of the $n = 1/2$ hydrogen atom, $H(n = 1/2)$ is reported. Samples of the nickel cathodes of aqueous potassium carbonate electrolytic cells and aqueous sodium carbonate electrolytic cells were analyzed by XPS (Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA). A broad peak centered at 54.6 eV was present only in the cases of the potassium carbonate cells. The binding energy (in vacuum) of $H(n = 1/2)$ is 54.4 eV. Thus, the theoretical and measured binding energies for $H(n = 1/2)$ are in excellent agreement.

Further experimental identification of hydrinos—down to $H(n = 1/8)$ —can be found in the alternative explanation by Mills et al. for the soft X-ray emissions of the dark interstellar medium observed by Labov and Bowyer [Labov, S., Bowyer, S., "Spectral observations of the extreme ultraviolet background", *The Astrophysical Journal*, 371, (1991), pp. 810-819] of the Extreme UV Center of the University of California, Berkeley. The agreement between the experimental spectrum and the energy values predicted for the proposed transitions is remarkable.

The reaction product of two $H(n=1/2)$ atoms, the dihydrino molecule, was identified by mass spectroscopy (Shrader Analytical & Consulting Laboratories). The mass spectrum of the cryofiltered gases evolved during the electrolysis of a light water K_2CO_3 electrolyte with a nickel cathode demonstrated that the dihydrino molecule, $H_2\left(n = \frac{1}{2}\right)$, has a higher ionization energy, about 63 eV, than normal molecular hydrogen, $H_2(n = 1)$, 15.46 eV. The high resolution (0.001 AMU) magnetic sector mass spectroscopic analysis of the postcombustion gases indicated the presence of two peaks of nominal mass two-- one peak at 70 eV and one peak at 25 eV. The same analysis of molecular hydrogen indicates only one peak at 25 eV and one peak at 70 eV. In the case of the postcombustion sample at 70 eV, one peak was assigned as the hydrogen molecular ion peak, $H_2^+(n = 1)$, and one peak was assigned as the dihydrino molecular peak, $H_2^+\left(n = \frac{1}{2}\right)$ which has a slightly larger magnetic moment.

20. Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", *Fusion Technology*, Vol. 25, 103 (1994).

Calorimetry of pulsed current and continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed by Thermacore, Inc., Lancaster, PA. The excess power out of 41 watts exceeded the total input power given by the product of the electrolysis voltage and current by a factor greater than 8. Elemental analysis of the electrolyte and metallurgical analysis of the cathode showed no evidence of

chemical reactions. The pH, specific gravity, concentration of K_2CO_3 , and the elemental analysis of the electrolyte sample taken after 42 days of continuous operation were unchanged from that of the values obtained for the electrolyte sample taken before operation. Elemental analysis and scanning electron microscopy of metallurgical samples of the nickel cathode taken before operation and at day 56 of continuous operation were identical indicating that the nickel cathode had not changed chemically or physically. Scintillation counter and photographic film measurements showed that no radiation above background was detected indicating that nuclear reactions did not occur.

The "ash" of the exothermic reaction is atoms having electrons of energy below the "ground state" which are predicted to form molecules. The predicted molecules were identified by lack of reactivity with oxygen, by separation from molecular deuterium by cryofiltration, and by mass spectroscopic analysis. The combustion of the gases evolved during the electrolysis of a light water K_2CO_3 electrolyte (K^+/K^+ electrocatalytic couple) with a nickel cathode was incomplete. The mass spectroscopic analysis (Dr. David Parees of Air Products & Chemicals, Inc.) of the $m/e = 2$ peak of the combusted gas demonstrated that the dihydrino molecule, $H_2(n = 1/2)$, has a higher ionization energy than H_2 .

Calorimetry of pulsed current and continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed in single cell dewar calorimetry cells by HydroCatalysis Power Corporation. Excess power out exceeded input power by a factor greater than 16. No excess heat was observed when the electrolyte was changed from potassium carbonate to the control sodium carbonate. The faraday efficiency was measured volumetrically to be 100%.

19. V. Noninski, Fusion Technol., Vol. 21, 163 (1992).

Dr. Noninski of the Laboratory for Electrochemistry of Renewed Electrode-Solution Interface (LEPGER) successfully reproduced the results of Mills and Kneizys [R. Mills and S. Kneizys, Fusion Technol. Vol. 20, 65 (1991)] as a visiting professor at Franklin and Marshall College. A significant increase in temperature with every watt input, compared with the calibration experiment ($\approx 50^\circ C / W$ versus $\approx 30^\circ C / W$), was observed during the electrolysis of potassium carbonate. This effect was not observed when sodium carbonate was electrolyzed. No trivial explanation (in terms of chemical reactions, change in heat transfer properties, etc.) of this effect were found.

18. Niedra, J., Meyers, I., Fralick, G. C., and Baldwin, R., "Replication of the Apparent Excess Heat Effect in a Light Water-Potassium Carbonate-Nickel Electrolytic Cell,

NASA Technical Memorandum 107167, February, (1996). pp. 1-20.; Niedra, J., Baldwin, R., Meyers, I., NASA Presentation of Light Water Electrolytic Tests, May 15, 1994.

NASA Lewis tested a cell identical to that of Thermacore [Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", Fusion Technology, Vol. 25, 103 (1994)] with the exception that it was minus the central cathode. A cell identical to the test cell with heater power only (no electrolysis) was the calibration control and the blank cell with the heater power equal to zero. The test cell was also calibrated "on the fly" by measuring the temperature relative to the blank cell at several values of heater input power of the test cell. "Replication of experiments claiming to demonstrate excess heat production in light water-Ni- K_2CO_3 electrolytic cells was found to produce an apparent excess heat of 11 W maximum, for 60 W electrical power into the cell. Power gains ranged from 1.06 to 1.68." The production of excess energy with a power gain of 1.68 would require 0% Faraday efficiency to account for the observed excess power.

17. Technology Insights, 6540 Lusk Boulevard, Suite C-102, San Diego, CA 92121, "HydroCatalysis Technical Assessment Prepared for PacifiCorp", August 2, 1996.

This report documents a technical assessment of a novel source of hydrogen energy advanced by HydroCatalysis Power Corporation now BlackLight Power, Inc. (BLP). The assessment was conducted as part of the due diligence performed for PacifiCorp. It was conducted by a literature search and review, site visits to BLP and collaborating organizations, and telephone interviews with others active in the general area. A description of concept has been provided above. Also provided above are an assessment of the concept background, supporting theory, laboratory prototypes, projected initial products, and economic and environmental aspects, as well as documenting the results of telephone interviews and site visits. An overall summary and conclusions are presented in the following section.

16. P. M. Jansson, "HydroCatalysis: A New Energy Paradigm for the 21st Century", Thesis Submitted in partial fulfillment of the requirements of the Masters of Science in Engineering Degree in the Graduate Division of Rowan University, May 1997, Thesis Advisors: Dr. J. L. Schmalzel, Dr. T. R. Chandrupatla, and Dr. A. J. Marchese, External Advisors: Dr. J. Phillips, Pennsylvania State University, Dr. R. L. Mills, BlackLight Power, Inc., W. R. Good, BlackLight Power, Inc.

This thesis reviews the problems of worldwide energy supply, describes the current technologies that meet the energy needs of our industrial societies, summarizes the environmental impacts of those fuels and technologies and their increased use by a growing global and increasing technical economy. The work also describes and advances the technology being developed by BlackLight Power, Inc. (BLP) a scientific company located in Princeton, New Jersey. BLP's technology proports to offer commercially viable and useful heat generation via a previously unrecognized natural phenomenon - the catalytic reduction of the hydrogen atom to a lower energy state. Laboratory tests obtained as original research of this thesis as well as the review of the data of others substantiate the fact that replication of the experimental conditions which are favorable to initiating and sustaining the new energy release process will generate controllable, reproducible, sustainable and commercial meaningful heat. For example, Jansson has determined heat production associated with hydrino formation with a Calvet calorimeter which yielded exceptional results. Specifically, the results are completely consistent with Mills hydrino formation hypothesis. Approximately 10^{-3} moles of hydrogen was admitted to a 20 cm^3 Calvet cell containing a heated platinum filament and KNO_3 powder. In the three separate trials with a platinum filament hydrogen dissociator which was varied in length of 10 cm, 20 cm, and 30 cm, a mean power of 0.581, 0.818, and 1.572 watts was observed, respectively. The closed experiments were run to completion. The energy observed was 622, 369, and 747 kJ, respectively, This is equivalent to the generation of $6.2 \times 10^8\text{ J/mole}$, $3.7 \times 10^8\text{ J/mole}$, and $7.5 \times 10^8\text{ J/mole}$ of hydrogen, respectively, as compared to $2.5 \times 10^5\text{ J/mole}$ of hydrogen anticipated for standard hydrogen combustion. Thus, the total heats generated appear to be at least 1000 times too large to be explained by conventional chemistry, but the results are completely consistent with Mills model. Convincing evidence is presented to lead to the conclusion that BLP technology has tremendous potential to achieve commercialization and become an energy paradigm for the next century. The research was also conducted as part of the due diligence performed for Atlantic Energy now Conectiv.

15. **Phillips, J., Smith, J., Kurtz, S., "Report On Calorimetric Investigations Of Gas-Phase Catalyzed Hydrino Formation" Final report for Period October-December 1996", January 1, 1997, A Confidential Report submitted to BlackLight Power, Inc. provided by BlackLight Power, Inc., Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined heat production associated with hydrino formation with a Calvet calorimeter which yielded

exceptional results. Specifically, the results are completely consistent with Mills hydrino formation hypothesis. In three separate trials, between 10 and 20 K Joules were generated at a rate of 0.5 Watts, upon admission of approximately 10^{-3} moles of hydrogen to the 20 cm^3 Calvet cell containing a heated platinum filament and KNO_3 powder. This is equivalent to the generation of 10^7 J/mole of hydrogen, as compared to $2.5 \times 10^5 \text{ J/mole}$ of hydrogen anticipated for standard hydrogen combustion. Thus, the total heats generated appear to be 100 times too large to be explained by conventional chemistry, but the results are completely consistent with Mills model.

- 14. Phillips, J., Shim, H., "Additional Calorimetric Examples of Anomalous Heat from Physical Mixtures of K/Carbon and Pd/Carbon", January 1, 1996, A Confidential Report submitted to HydroCatalysis Power Corporation provided by HydroCatalysis Power Corporation, Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined excess heat release from flowing hydrogen in the presence of ionic hydrogen spillover catalytic material: 40% by weight potassium nitrate (KNO_3) on graphitic carbon powder with 5% by weight 1%-Pd-on-graphitic carbon (K^+/K^+ electrocatalytic couple) by the very accurate and reliable method of heat measurement, thermopile conversion of heat into an electrical output signal. Excess power and heat were observed with flowing hydrogen over the catalyst. However, no excess power was observed with flowing helium over the catalyst mixture. Rates of heat production were reproducibly observed which were higher than that expected from the conversion of all the hydrogen entering the cell to water, and the total energy observed was over four times larger than that expected if all the catalytic material in the cell were converted to the lowest energy state by "known" chemical reactions. Thus, "anomalous" heat, heat of a magnitude and duration which could not be explained by conventional chemistry, was reproducibly observed.

- 13. Bradford, M. C., Phillips, J., "A Calorimetric Investigation of the Reaction of Hydrogen with Sample PSU #1", September 11, 1994, A Confidential Report submitted to HydroCatalysis Power Corporation provided by HydroCatalysis Power Corporation, Great Valley Corporate Center, 41 Great Valley Parkway, Malvern, PA 19355.**

Pennsylvania State University Chemical Engineering Department has determined excess heat release from flowing hydrogen in the presence of nickel oxide powder containing

strontium niobium oxide ($\text{Nb}^{3+}/\text{Sr}^{2+}$ electrocatalytic couple) by the very accurate and reliable method of heat measurement, thermopile conversion of heat into an electrical output signal. Excess power and heat were observed with flowing hydrogen over the catalyst which increased with increasing flow rate. However, no excess power was observed with flowing helium over the catalyst/nickel oxide mixture or flowing hydrogen over nickel oxide alone. Approximately 10 cc of nickel oxide powder containing strontium niobium oxide immediately produced 0.55 W of steady state output power at 523 K. When the gas was switched from hydrogen to helium, the power immediately dropped. The switch back to hydrogen restored the excess power output which continued to increase until the hydrogen source cylinder emptied at about the 40,000 second time point. With no hydrogen flow the output power fell to zero.

The source of heat is assigned to the electrocatalytic, exothermic reaction whereby the electrons of hydrogen atoms are induced to undergo transitions to quantized energy levels below the conventional "ground state". These lower energy states correspond to fractional quantum numbers: $n = 1/2, 1/3, 1/4, \dots$. Transitions to these lower energy states are stimulated in the presence of pairs of niobium and strontium ions ($\text{Nb}^{3+}/\text{Sr}^{2+}$ electrocatalytic couple) which provide 27.2 eV energy sinks.

12. Jacox, M. G., Watts, K. D., "The Search for Excess Heat in the Mills Electrolytic Cell", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, January 7, 1993.

Idaho National Engineering Laboratory (INEL) operated a cell identical to that of Thermacore [Mills, R., Good, W., Shaubach, R., "Dihydrino Molecule Identification", Fusion Technology, Vol. 25, 103 (1994)] except that it was minus the central cathode and that the cell was wrapped in a one-inch layer of urethane foam insulation about the cylindrical surface. The cell was operated in a pulsed power mode. A current of 10 amperes was passed through the cell for 0.2 seconds followed by 0.8 seconds of zero current for the current cycle. The cell voltage was about 2.4 volts, for an average input power of 4.8 W. The electrolysis power average was 1.84 W, and the stirrer power was measured to be 0.3 W. Thus, the total average net input power was 2.14 W. The cell was operated at various resistance heater settings, and the temperature difference between the cell and the ambient as well as the heater power were measured. The results of the excess power as a function of cell temperature with the cell operating in the pulsed power mode at 1 Hz with a cell voltage of 2.4 volts, a peak current of 10 amperes, and a duty cycle of 20 % showed that the excess power is temperature dependent for pulsed power operation, and the maximum

excess power was 18 W for an input electrolysis joule heating power of 2.14 W. Thus, the ratio of excess power to input electrolysis joule heating power was 850 %. INEL scientists constructed an electrolytic cell comprising a nickel cathode, a platinized titanium anode, and a 0.57 M K_2CO_3 electrolyte. The cell design appears in Appendix 1. The cell was operated in the environmental chamber in the INEL Battery Test Laboratory at constant current, and the heat was removed by forced air convection in two cases. In the first case, the air was circulated by the environmental chamber circulatory system alone. In the second case, an additional forced air fan was directed onto the cell. The cell was equipped with a water condenser, and the water addition to the cell due to electrolysis losses was measured. The data of the forced convection heat loss calorimetry experiments during the electrolysis of a 0.57 M K_2CO_3 electrolyte with the INEL cell showed that 13 W of excess power was produced. This excess power could not be attributed to recombination of the hydrogen and oxygen as indicated by the equivalence of the calculated and measured water balance.

11. Peterson, S., H., Evaluation of Heat Production from Light Water Electrolysis Cells of HydroCatalysis Power Corporation, Report from Westinghouse STC, 1310 Beulah Road, Pittsburgh, PA, February 25, 1994.

Westinghouse Electric Corporation reports that excess heat was observed during the electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) where the electrolysis of aqueous sodium carbonate served as the control. The data of the temperature of the cell minus the ambient temperature shows that when potassium carbonate replaced sodium carbonate in the same cell with the same input electrolysis power, the potassium experiment was twice as hot as the sodium carbonate experiment for the duration of the experiment, one month. The net faraday efficiency of gas evolution was experimentally measured to be unity by weighing the experiment to determine that the expected rate of water consumption was observed. The output power exceeded the total input power. The data was analyzed by HydroCatalysis Power Corporation [Mills, R., Analysis by HydroCatalysis Power Corporation of Westinghouse Report Entitled "Evaluation of Heat Production from Light Water Electrolysis Cells of HydroCatalysis Power Corporation, Report from Westinghouse STC", February 25, 1994].

10. Haldeman, C. W., Savoye, G. W., Iseler, G. W., Clark, H. R., MIT Lincoln Laboratories Excess Energy Cell Final report ACC Project 174 (3), April 25, 1995.

During the electrolysis of aqueous potassium carbonate, researchers working at MIT Lincoln Laboratories observed long duration excess power of 1-5 watts with output/input

ratios over 10 in some cases with respect to the cell input power reduced by the enthalpy of the generated gas. In these cases, the output was 1.5 to 4 times the integrated volt-ampere power input. Faraday efficiency was measured volumetrically by direct water displacement.

9. Craw-Ivanco, M. T.; Tremblay, R. P.; Boniface, H. A.; Hilborn, J. W.; "Calorimetry for a $\text{Ni}/\text{K}_2\text{CO}_3$ Cell", Atomic Energy Canada Limited, Chemical Engineering Branch, Chalk River Laboratories, Chalk River, Ontario, June 1994.

Atomic Energy Canada Limited, Chalk River Laboratories, report that 128 % and 138% excess heat were observed in separate experiments by flow calorimetry during the electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) in a closed cell, and that 138% was observed in an open cell.

8. Shaubach, R. M., Gernert, N. J., "Anomalous Heat From Hydrogen in Contact with Potassium Carbonate", Thermacore Report, March 1994.

A high temperature/high pressure/high power density industrial prototype gas cell power generator which produced 50 watts of power at 300 °C having a nickel surface area of only 300 cm² was successfully developed. A sample of the nickel tubing of the aqueous potassium carbonate permeation cell was analyzed by XPS at the Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA. A broad peak centered at 54.6 eV was present; whereas, the control nickel tube showed no feature. The binding energy (in vacuum) of $\text{H}(n = 1/2)$ is 54.4 eV. Thus, the theoretical and measured binding energies for $\text{H}(n = 1/2)$ are in excellent agreement. No excess energy or 54.6 eV feature were observed when sodium carbonate replaced potassium carbonate.

7. Gernert, N., Shaubach, R. M., Mills, R., Good, W., "Nascent Hydrogen: An Energy Source," Final Report prepared by Thermacore, Inc., for the Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base, Contract Number F33615-93-C-2326, May, (1994).

In a report prepared for the Aero Propulsion and Power Directorate, Wright Laboratory, Air Force Material Command (ASC), Wright-Patterson Air Force Base, Thermacore reports, "anomalous heat was observed from a reaction of atomic hydrogen in contact with potassium carbonate on a nickel surface. The nickel surface consisted of 500 feet of 0.0625 inch diameter tubing wrapped in a coil. The coil was inserted into a pressure vessel containing a light water solution of potassium carbonate. The tubing and solution were heated to a steady state temperature of 249 °C using an I²R heater. Hydrogen at 1100

psig was applied to the inside of the tubing. After the application of hydrogen, a 32 °C increase in temperature of the cell was measured which corresponds to 25 watts of heat. Heat production under these conditions is predicted by the theory of Mills where a new species of hydrogen is produced that has a lower energy state than normal hydrogen. ESCA analysis, done independently by Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, have found the predicted 55 eV signature of this new species of hydrogen."

**6. Wiesmann, H., Brookhaven National Laboratory, Department of Applied Science,
Letter to Dr. Walter Polansky of the Department of Energy Regarding Excess
Energy Verification at Brookhaven National Laboratory, October 16, 1991.**

Calorimetry of continuous electrolysis of aqueous potassium carbonate (K^+/K^+ electrocatalytic couple) at a nickel cathode was performed in single cell dewar calorimetry cell by Noninski at Brookhaven National Laboratory. Dr. Weismann observed the experiment and reported the results to Dr. Walter Polansky of the U. S. Department of Energy. Dr. Weismann reports, "The claim is as follows. The temperature rise in the dewar is greater in the case of electrolysis as compared to using a resistor, even though the power dissipated is equal in both cases. According to Dr. Mills' theory, this apparent "excess power" is due to the fact that the electron in a hydrogen atom can "decay" to stable subinterger quantum levels. Dr. Noninski demonstrated this thermal effect at BNL." The observed rise in temperature for a given input power was twice as high comparing electrolysis versus heater power.

**5. Nesterov, S. B., Kryukov, A. P., Moscow Power Engineering Institute Affidavit,
February, 26,1993.**

The Moscow Power Engineering Institute experiments showed 0.75 watts of heat output with only 0.3 watts of total power input (power = VI) during the electrolysis of an aqueous potassium carbonate electrolyte with a nickel foil cathode and a platinized titanium anode. Excess power over the total input on the order of 0.45 watts was produced reliably and continuously over a period of three months. Evaluation of the electrolyte after three months of operation showed no significant change in its density or molar concentration. The cell was disassembled and inspected after over one month of operation at 0.1 amperes. This inspection showed no visible signs of a reaction between the electrodes and the electrolyte. The cell was re-assembled and operated as before. Excess energy was produced for the

three month duration of the experiment. Scintillation counter measurements showed no signs of radiation external to the cell.

4. Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University Bethlehem, PA, November 1993.

Samples of the nickel cathodes of aqueous potassium carbonate electrolytic cells and aqueous sodium carbonate electrolytic cells were analyzed by XPS by Miller and Simmons of the Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA. A broad peak centered at 54.6 eV was present only in the cases of the potassium carbonate cells. The binding energy (in vacuum) of $H(n = 1/2)$ is 54.4 eV. Thus, the theoretical and measured binding energies for $H(n = 1/2)$ are in excellent agreement. Lehigh University has conducted an extensive investigation of the cathodes from heat producing as well as those from control cells. Miller concludes that "I was unable to find any other elements on the surface that cause the feature. The persistent appearance of a spectral feature near the predicted binding energy for many of the electrodes used with a K electrolyte is an encouraging piece of evidence for the existence of the reduced energy state hydrogen".

3. Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993.

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, November 1993] were confirmed at Idaho National Engineering Laboratory (INEL). Samples which demonstrated the feature as well as control electrodes were tested for the presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass Spectroscopy) and XPS analysis of the nickel surface was performed by Charles Evans & Associates, Sunnyvale, CA [Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number 40150, March 18, 1994]. The 54.6 eV feature was also observed by Charles Evans & Associates in the case of cathodes of potassium carbonate electrolytic cells [Craig, A., Y., Charles Evans & Associates XPS/ESCA Results, CE&A Number 44545, November 3, 1994]. Iron and lithium were the only remaining atoms which were in question

by Lehigh University and INEL as the source of the 54.6 eV XPS peak. The Charles Evans TOF-SIMS results demonstrate that iron and lithium were not the source of this peak.

2. Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number 40150, March 18, 1994.

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, November 1993] were confirmed at Idaho National Engineering Laboratory (INEL) [Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993]. Samples which demonstrated the feature as well as control electrodes were tested for the presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass Spectroscopy) and XPS analysis of the nickel surface was performed by Charles Evans & Associates, Sunnyvale, CA. The 54.6 eV feature was also observed by Charles Evans & Associates in the case of cathodes of potassium carbonate electrolytic cells [Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993]. Iron and lithium were the only remaining atoms which were in question by Lehigh University and INEL as the source of the 54.6 eV XPS peak. The Charles Evans TOF-SIMS results demonstrate that iron and lithium were not the source of this peak.

1. Craig, A., Y., Charles Evans & Associates XPS/ESCA Results, CE&A Number 44545, November 3, 1994.

The Lehigh XPS results of a broad peak centered at 54.6 eV present only in the cases of the potassium carbonate cells [Miller, A., Simmons, G., Lehigh X-Ray Photoelectron Spectroscopy Report, Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA, November 1993] were confirmed at Idaho National Engineering Laboratory (INEL) [Jacox, M. G., Watts, K. D., "INEL XPS Report", Idaho National Engineering Laboratory, EG&G Idaho, Inc., Idaho Falls, Idaho, 83415, November 1993]. Samples which demonstrated the feature as well as control electrodes were tested for the presence of trace amounts of impurities of the elements iron and lithium at a sensitivity level of greater than 1000 times that of XPS. TOF-SIMS (Time of Flight-Secondary Ion Mass

Spectroscopy) and XPS analysis of the nickel surface was performed by Charles Evans & Associates, Sunnyvale, CA [Lee, Jang-Jung, Charles Evans & Associates Time-Of-Flight Secondary Ion Mass Spectroscopy (TOF-SIMS) Surface Analysis Report, CE&A Number 40150, March 18, 1994]. The 54.6 eV feature was also observed by Charles Evans & Associates in the case of cathodes of potassium carbonate electrolytic cells. Iron and lithium were the only remaining atoms which were in question by Lehigh University and INEL as the source of the 54.6 eV XPS peak. The Charles Evans TOF-SIMS results demonstrate that iron and lithium were not the source of this peak.

Given Applicant's full compliance with the new standards imposed by Specialist McGinty during the February 11, 2003 Interview, which required independent validation of the experimental evidence of record, Applicant is entitled to have this evidence accepted as reliable and to have this and other BlackLight applications issue as patents.

Applicant's Response Documenting Examiner Langel's Reaffirmation of the Utility and Operability of Applicant's Novel Hydrogen Technology and His Subsequent Removal From Examining All BlackLight Cases

Pursuant to representations and agreements made during the February 11 Interview (reprinted below), Applicant followed up with the submission of much of the above scientific evidence in two copending BlackLight applications by arranging an Interview with Examiner Langel, who was assigned to those cases. [U.S. Serial Nos. 09/110,678 ('678 application) and 09/362,693 ('693 application).] The express purpose of the Interview, held on April 14, 2003, was to review those two applications on a claim-by-claim basis to ensure that the scientific data presented adequately supported the scope of the claims. Examiner Langel expressed once again his view that the claims of the two applications were adequately supported by the data and, therefore, that claims were allowable.

A detailed account of the discussions Applicant's counsel, Jeffrey Melcher and Jeffrey Simenauer, had with Examiner Langel during the April 14, 2003 Interview, and with Examiner Langel and his supervisor, SPE Stanley Silverman, during follow-up telephone Interviews were documented in Supplemental Responses filed in the '678 and '693 applications, comments from which are reproduced below. Based on the

shocking revelations divulged during these discussions, Applicant must once again protest in the strongest terms possible the manner in which an anonymous group of PTO officials (*i.e.*, the "Secret Committee") has mishandled the examination of BlackLight's patent applications relating to Applicant's novel hydrogen technology.

Counsel was particularly distressed to learn that after Examiner Langel met with Supervisor Silverman to advocate allowing the '678 and '693 applications to issue as patents, his supervisor informed him that "allowance is not an option." Despite the Examiner's careful study of the overwhelming weight of the scientific data supporting allowance, his supervisor further instructed him to "make it appear as if you have authority [to allow the applications] and that you are in favor of full rejection."

Understandably, Examiner Langel felt uneasy having been asked to make representations on the record that were not true. He explained that, "for moral and ethical reasons," he had no choice but to allow himself to be removed from examining all assigned BlackLight applications. Although Supervisor Silverman admitted that the removal decision had been made "partially by [him] and partially by others," he would not reveal who those "others" were.

Applicant strongly objects to Examiner Langel's removal under these egregious circumstances and demands that the PTO reinstate him immediately and allow BlackLight's applications to issue. The Secret Committee is duty bound to honor the representations and agreements made by Quality Assurance Specialist Douglas McGinty during the February 11, 2003 Interview, declaring that:

- (1) Examiner Langel and the other Examiners of record have "full authority" to review the scientific data supporting lower energy states of hydrogen generated and furnished by independent third parties and, based on that review, to issue patents as deemed appropriate;
- (2) Applicant should confer with the Examiners, either by telephone or in person, to review each assigned application on a claim-by-claim basis to ensure that the scientific data presented adequately supports the scope of the claims; and
- (3) for those claims determined to be adequately supported by the data, a patent will issue; for any claims deemed to be inadequately supported, Applicant reserves the right to continue seeking that broader claim coverage in

subsequent proceedings. [See March 6, 2003 Response filed in the '678 application]

It was precisely because of the many prior abuses that led to this short-lived "breakthrough" that U.S. Congressman David Wu sent his Senior Legislative Assistant, Ted Liu, to attend the February 11 Interview. Prior to the Interview, a senior PTO official alleged to Mr. Liu that there was no "Secret Committee." At the Interview, Mr. Liu witnessed not only Specialist McGinty's representation that Examiner Langel had the authority to allow BlackLight's applications, but the Examiner's unequivocal statement that the applications were, in fact, allowable and that he was prepared to issue Applicant his patents right then and there. [See supra and Attachment P]

Despite those representations, an anonymous group of individuals has now declared that allowance is not even an option in BlackLight's cases. Worse yet, this Secret Committee sought to leave the false impression on the record that Examiner Langel—and perhaps other Examiners of record—had the authority to allow BlackLight's applications, and that he favored the rejection of claims over allowance.

In view of this unfortunate incident, Applicant is entitled to a complete accounting of events leading to Examiner Langel's removal, including identification of all persons involved in making that decision. In raising an objection to the removal with Supervisor Silverman, Applicant's counsel requested that he identify those decision-makers, but was told, "You figure it out!"

Detailed Account of the April 14, 2003 Interview and Subsequent Discussions

As stated above, the express purpose of the April 14, 2003 Interview was to review the scientific data generated and furnished by independent third parties identified in the March 6, 2003 Response that was filed in the '678 and '693 applications in support of the lower energy states of hydrogen and to ensure that the data adequately supported the scope of the claims to secure their allowance.

Applicant had no reason to suspect that this approach, as agreed to during the prior February 11, 2003 Interview, was about to be completely scrapped. During the subsequent April 14, 2003 Interview, Examiner Langel once again reaffirmed his long-held opinion that the scientific data demonstrated the operability of Applicant's novel

hydrogen technology, thus warranting patent protection. The Examiner's comments made clear that, prior to the interview, he had extensively reviewed Applicant's data, as well as the summary statements characterizing that data, appearing in the prior Responses filed in the '678 and '693 applications. Based on that review, Examiner Langel expressed several times during the Interview his willingness to allow those cases. Those views were confirmed by the Examiner in his interview summary, which stated that "[t]he participants presented data establishing the existence of lower-energy hydrogen." [See April 14, 2003 Interview Summary Form filed in the '678 and '693 applications (Attachment F).]

Examiner Langel, however, refrained from indicating allowance of any specific claims for two stated reasons. First, a few items of submitted data summarized in the March 6 Response inexplicably could not be located in the PTO files. The Examiner wanted time to confirm the data had been made of record, as well as Applicant's description of its relevance. Second, despite Specialist McGinty's representation at the February 11 Interview that Examiner Langel had full authority to review the data and to issue claims in this case, the Examiner explained that he needed to advise him and Supervisor Silverman of his intention to do so.

Examiner Langel then recalled a recent visit to his office by Group Director Jacqueline Stone informing him—again, contrary to what Applicant was told at the February 11, 2003 Interview—that he did not have authority to issue Notices of Allowance, or to otherwise give indications of allowance, in any BlackLight applications. Director Stone instructed Examiner Langel that he would need Specialist McGinty's permission before so indicating allowance.

Examiner Langel did, however, note that Supervisor Silverman and Specialist McGinty had agreed before the February 11 Interview to allow claims if Applicant could show that his submitted scientific data was generated by independent third parties. The Examiner reassured counsel that he would present to his superiors the scientific data discussed at the April 14 Interview with a recommendation of allowance consistent with his past views.

Applicant's counsel agreed that it made sense to allow time for Examiner Langel to discuss the case with his superiors and for counsel to resubmit the few missing items

of scientific data, whereupon arrangement was made to continue with the personal Interview on the following day, April 15th. That morning, however, counsel received a distressing telephone message from Examiner Langel informing him that the Interview had been canceled. The Examiner stated that Supervisor Silverman had removed him from the subject cases and that he was no longer assigned to any BlackLight applications.

Applicant's counsel immediately telephoned Examiner Langel for a further explanation of what had happened. The Examiner confirmed his removal following the meeting he had arranged with Supervisor Silverman to discuss the scientific data that had been the subject of the previous day's Interview and to advocate allowance of the claims in the two subject applications. Examiner Langel informed counsel that his supervisor refused to even look at the data and, in response to his recommendation of allowance, Supervisor Silverman told him "allowance is not an option." According to Examiner Langel he was then told: "Make it appear as if you have authority [to allow the applications] and that you are in favor of full rejection."

Examiner Langel explained that, regrettably, he had no choice but to resign from further examination of BlackLight's applications. According to the Examiner, Supervisor Silverman gave him the option of staying on, "but not really—I could not go on like this." He explained that "for moral and ethical reasons," he could no longer continue to examine his assigned cases.

Alarmed by this sudden turn of events, counsel called Supervisor Silverman the following day, April 16th, to object to Examiner Langel's removal and to seek his reinstatement. Supervisor Silverman confirmed that Examiner Langel would no longer be examining Blacklight's patent applications and that all cases were in the process of being consolidated and transferred to a new Examiner.

Counsel kindly requested that Supervisor Silverman explain why those cases were being transferred and who made that decision. He initially refused to discuss the matter, saying only that, "I am not going to be put on the stand and cross examined on this." Upon further prodding, Supervisor Silverman volunteered that "the decision was made partially by me and partially by others." He refused, however, to be more specific

when asked to identify the “others” involved in the decision, stating “I am not going to discuss that. You can say that it was *my* decision.”

Counsel then informed Supervisor Silverman of Applicant’s intention to file an objection to Examiner Langel’s removal and to the consolidation and transfer of BlackLight’s applications to a new Examiner. Counsel explained that Applicant had expended enormous amounts of time and money over a period of many years prosecuting BlackLight’s patent applications before Examiner Langel and getting him up to speed on the claimed technology and the extensive scientific data confirming its operation. Counsel argued that it was unfair now to remove Examiner Langel and transfer all of BlackLight’s cases to a new Examiner just to begin the process all over again. Supervisor Silverman would hear none of it, again stating, “I’m not going to discuss it.”

Applicant’s counsel made one last attempt to learn the identity of the other PTO officials responsible for taking that drastic action and their reasons for doing so. Supervisor Silverman again refused this request for information, snapping at counsel, “You figure it out!” Counsel then asked the Supervisor whom they might talk to so they could “figure it out” as he put it. Supervisor Silverman advised counsel, “Talk to whomever you want,” but when asked whom specifically he had in mind, he again retorted, “I don’t like to be cross-examined.”¹⁰⁸

At the end of the conversation, Supervisor Silverman attempted to justify the PTO’s extreme actions by claiming that it was in the “best interest” to transfer the applications. But, when asked by counsel whose best interest was being served by the transfer, he refused to answer. Instead, Supervisor Silverman offered a stunning revelation that Applicant’s novel hydrogen technology was “beyond Examiner Langel’s technical expertise” and that all of the BlackLight cases would be consolidated and transferred to another examiner with “more technical expertise.” He would not elaborate on who this new, more highly qualified Examiner might be.¹⁰⁹

¹⁰⁸ Counsel has taken steps “to figure it out” and expressly reserves the right to further supplement the objections raised herein as additional facts come to light. (Attachment R)

¹⁰⁹ Supervisor Silverman’s statement that all of BlackLight’s applications were being consolidated and transferred to a single, more qualified Examiner turned out to be untrue. In fact, Applicant’s cases

Needless to say, at no time during the five years Applicant has been prosecuting his patent applications before Examiner Langel—who has over thirty years of Patent Office experience—did his technical expertise ever come into question. Indeed, throughout the lengthy prosecution of these cases, counsel has been impressed with the Examiner's in-depth knowledge of chemistry and physics, as well as other scientific principles, underlying Applicant's novel hydrogen technology. That Supervisor Silverman would raise Examiner Langel's technical competence as an issue at such a late stage of that prosecution only heightens Applicant's suspicions as to the real motivation for removing Examiner Langel.

Immediately following the conversation with Supervisor Silverman, counsel telephoned Examiner Langel one last time to apprise him of the situation and to thank him for his many years of service in examining BlackLight's applications. Examiner Langel expressed regret over his removal from those cases and confirmed that he had "learned a lot about [BlackLight's] technology." The Examiner also expressed surprise that his expertise was now being called into question.

Examiner Langel shared counsel's exasperation over the situation. Counsel asked him if he knew of any other instances in which a PTO Examiner had been instructed to represent that he had authority to allow an application when, in fact, he had no such authority, and that he favored rejecting claims when he actually wanted to allow them. The Examiner's exact words were: "I've never seen anything like it."

Frankly, neither has Applicant's counsel and, in view of these unique circumstances, Applicant must once again strenuously object to the abusive treatment to which his applications have been subjected.

Demand for Information and Redress

Applicant believes that the totality of events documented above are highly relevant to the PTO's examination of all of BlackLight's patent applications and accurately describe the detrimental effects that examination has had on Applicant's patent rights. These events further demonstrate the PTO's failure to provide adequate

currently remain spread between four Examiners, not one: Examiners Kalafut, Tsang-Foster, Wells and Wayner.

safeguards to the interests of Applicant, including fair and expeditious examination, as contemplated by the Federal Circuit in its June 28, 2002 Decision. Applicant therefore respectfully demands that the PTO provide certain information and redress, including:

- 1) identification of all Examiners or other PTO personnel who were consulted, or otherwise provided input, in the examination of BlackLight's applications;
- 2) identification of all outside consultants or other persons who were consulted, or otherwise provided input, in the examination of BlackLight's applications;
- 3) identification of all PTO officials responsible for withdrawing BlackLight's five allowed applications from issuance and a complete disclosure of the facts and circumstances surrounding that withdrawal action;
- 4) identification of all outside sources of information who may have precipitated, or otherwise contributed to, the PTO withdrawing BlackLight's five allowed applications from issuance and a complete disclosure of the facts and circumstances surrounding those actions;
- 5) a complete disclosure of the facts and circumstances surrounding the removal of Examiner Langel from examining BlackLight's applications and the transfer those cases to a new Examiner, including, but not limited to, identification of all persons involved these incidents;
- 6) immediate reinstatement of Examiner Langel to his position as the Examiner of record in all BlackLight applications to which he had been previously assigned;
- 7) the examination and issuance of all allowable BlackLight applications in accordance with the representations and agreements made at the February 11, 2003 Interview; and
- 8) as a matter of equity, the immediate issuance, without further examination, of all five of BlackLight's withdrawn patent applications due to the PTO's failure to provide the safeguards to the interests of Applicant, including fair and expeditious further examination as contemplated by the Federal Circuit in its June 28, 2002 Decision.

**Response to Specific Arguments Set Forth in
the Secret Committee's Present Office Action**

As detailed above, Applicant reached agreements with the PTO during the February 11, 2003 Interview as to how it would conduct future examination of BlackLight's applications following the tumultuous prosecution history of these cases. The PTO's Secret Committee, however, defaulted on those agreements in subsequent Office Actions, including the present one. As a result, examination in this case has reverted to the point where, once again, Applicant's scientific evidence proving the existence of lower-energy hydrogen is almost entirely ignored based on strained theoretical grounds in the absence of any reasonable patent standards. Despite these improperly imposed barriers to patentability, Applicant will not be deterred from seeking the patent rights to which he is entitled.

With that said, Applicant now addresses the numerous shortcomings in the Committee's latest Office Action, which represents a significant step backwards in the prosecution of this case.

**The Secret Committee Once Again Misconstrues
Facts And Unfairly Sets New Standards In
Dismissing Applicant's Scientific Evidence**

In rejecting the present claims, the Committee adopts entirely new patentability standards for this one Applicant, while dismissing the scientific evidence of record—or ignoring it altogether—in violation of established PTO practices. This refusal to give serious consideration to Applicant's scientific evidence is in keeping with the PTO's steadfast position that "allowance is not an option," as communicated to Examiner Wayne Langel by his supervisor prior to his resignation from examining this and other BlackLight cases for "moral and ethical reasons."

This arbitrary approach to examination is typified by the Committee's opening arguments in the present Office Action, which misapprehend the proper burden of proof that applies in this case:

The applicant challenges the Examiner to provide an explanation of errors found in the extensive theory disclosed in the present specification and errors in the supporting experimental evidence. However, the burden of

proof rests with the Applicant in that he has to show to the Examiner that the experimental evidence demonstrates the existence of a novel hydrogen species and compositions of matter comprising a new form of hydrogen that is lower in energy than unreacted atomic hydrogen that corresponds to a fractional principal quantum number replacing the integer in the Rydberg equation for hydrogen excited states.

This argument is misplaced since the Committee is the one who has the initial burden to make a *prima facie* case of unpatentability before the burden shifts to Applicant. PTO standards require that the Committee meet that burden without presuming that the claimed invention is *per se* incredible to the exclusion of the supporting evidence of record. See MPEP § 2107, pp. 2100-31 ("[The Examiner should not begin an evaluation of utility by assuming that an asserted utility is likely to be false A conclusion that an asserted utility is incredible can be reached only after the Office has evaluated both the assertion of the applicant regarding utility and any evidentiary basis of that assertion."] (Emphasis added.)) But that is exactly what the Committee has done in this case, as documented in this and other prior responses. [See Appendix attached hereto.]

Despite this fatal error, Applicant has continued supplementing the record with an unprecedented amount of experimental data and detailed explanations of how that data confirms the existence of lower-energy hydrogen. Much of that scientific evidence, which was generated at considerable expense to Applicant, was submitted at the behest of the PTO under the assumption that it would be taken seriously and evaluated pursuant to proper PTO standards. However, as explained above, Applicant was mistaken in that assumption.

Incredibly, the Committee now asserts—in its opening argument no less—that it has no obligation to analyze the totality of Applicant's data so as to explain why that data allegedly fails to support the operability of the claimed invention. The Committee drives home this point in referring to Applicant's "challenge" that it "provide an explanation of errors found in the extensive theory disclosed in the present specification and errors in the supporting experimental evidence." The Committee fails to recognize, however, that this so-called "challenge" was simply a request that the PTO carry out its

administrative function and fairly evaluate Applicant's invention, including all supporting evidence.

The Committee's confusion on this point is also demonstrated by its further argument that "the burden of proof rests with the Applicant in that he has to show . . . the existence of a novel hydrogen species and composition of matter comprising [lower-energy] hydrogen." The Committee obviously ignores the fact that Applicant has already far exceeded any possible burden he may have had by providing a mountain of scientific evidence and explaining in great detail how that evidence proves the existence of lower-energy hydrogen. For the Committee to then invoke the "burden of proof" as an excuse to avoid having to consider and refute the merits of that evidence is nonsensical.

If the Committee has a legitimate basis for concluding that any of the multi-million dollars' worth of evidence submitted by Applicant fails to prove the lower-energy states of hydrogen—and Applicant would strongly dispute that any such basis exists—it is incumbent upon the Committee to fully explain its reasoning. Yet it refuses to do so.

The Committee Fails to Rebut Applicant's Overwhelming Scientific Evidence Proving the Existence of Lower-Energy Hydrogen

In a transparent attempt to justify its administrative failures, the Committee pays mere lip service to consideration of Applicant's scientific evidence by claiming that: "The Examiner considered the experimental evidence, but questions the validity of the experiments." The Committee, however, does not actually address the merits of that vast body of evidence in the main body of its Office Action,¹¹⁰ but rather, dismisses it wholesale by misconstruing facts and inventing new standards that serve to only highlight the inherent weakness of its arguments. The following statement appearing on pages 3-4 of the present Office Action is but one glaring example of this questionable practice:

¹¹⁰ To the limited extent that the Committee does address, mostly for the first time, a few aspects of Applicant's invention and his scientific evidence supporting the existence of lower-energy hydrogen in the Souw Appendix attached to the pending Office Action, those points are addressed and refuted in the corresponding arguments in the Appendix attached hereto.

If one analyzes the status of the latest experimental papers submitted by the Applicant (numbers 50 to 94) ^{*}, NONE of Applicant's alleged evidence of Applicant's lower-energy atomic hydrogen (the fictive "hydrino") are valid. Paper numbers 53, 55, 57, 58, 60-66, 68, and 70-94 have not yet been published in scientifically qualified journals with appropriate review process, therefore they are not yet credible. The other paper numbers (51-52, 54, 56, 59, 67, and 69) have been published in scientifically qualified journals, but do not refer to the "hydrino" or to the possible existence of states of a lower-energy atomic hydrogen having fractional energy levels.

^{*} Experimental paper numbers 1-49 as submitted by the Applicant with the initial application, have previously been analyzed and similarly were found to be non-credible.¹¹¹

Even a cursory inspection of the above-mentioned papers reveals the Committee's clearly erroneous view of Applicant's scientific evidence. Most of the data and its analysis has also been covered in other peer-reviewed articles published in highly reputable journals and, thus, are valid and credible by the Committee's own tacit admission.

For example, the data and its analysis reported in Paper No. 53 is also covered in the published peer-reviewed article:

17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.

To cite another example, the data and its analysis reported in Paper No. 55 is also covered in the published or in press peer-reviewed articles:

81. R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", European Physical Journal-Applied Physics, in press.

55. R. Mills, P. Ray, R. M. Mayo, "Chemically-Generated Stationary Inverted Lyman Population for a CW HI Laser", European J of Phys. D, submitted.

¹¹¹ Applicant addressed in his previous Response the Examiner's faulty analysis with respect to paper nos. 1-49. That prior Response demonstrated in detail, without rebuttal, the errors in finding those papers to be "non-credible."

57. R. L. Mills, P. Ray, "Spectroscopic Characterization of Stationary Inverted Lyman Populations and Free-Free and Bound-Free Emission of Lower-Energy State Hydride Ion Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Group I Catalysts", Journal of Quantitative Spectroscopy and Radiative Transfer, No. 39, sciencedirect.com, April 17, (2003).
54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.
51. R. Mills, P. Ray, R. M. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.
46. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population and a Very Stable Novel Hydride Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Catalysts", Optical Materials, in press.
42. R. L. Mills, P. Ray, "A Comprehensive Study of Spectra of the Bound-Free Hyperfine Levels of Novel Hydride Ion $H^-(1/2)$, Hydrogen, Nitrogen, and Air", Int. J. Hydrogen Energy, Vol. 28, No. 8, (2003), pp. 825-871.

Paper No. 57 was in fact published:

57. R. L. Mills, P. Ray, "Spectroscopic Characterization of Stationary Inverted Lyman Populations and Free-Free and Bound-Free Emission of Lower-Energy State Hydride Ion Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Group I Catalysts", Journal of Quantitative Spectroscopy and Radiative Transfer, No. 39, sciencedirect.com, April 17, (2003).

Paper No. 58 is in press after two years of intensive peer review:

58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press.

Paper Nos. 60, 61, and 63 are also published in peer reviewed journals:

60. R. L. Mills, J. Sankar, P. Ray, A. Voigt, J. He, B. Dhandapani, "Synthesis of HDLC Films from Solid Carbon", Journal of Material Science, Vol. 39, (2004), pp. 3309-3318.
61. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, Vol. 80, No. 1, pp. 1-20.

63. R. L. Mills, X. Chen, P. Ray, J. He, B. Dhandapani, "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry", *Thermochimica Acta*, Vol. 406/1-2, (2003), pp. 35-53.

Additionally, the data and its analysis reported in Paper No. 62 is covered in the following published or in-press peer-reviewed articles:

61. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", *Solar Energy Materials & Solar Cells*, Vol. 80, No. 1, pp. 1-20.
45. R. L. Mills, J. He, P. Ray, B. Dhandapani, X. Chen, "Synthesis and Characterization of a Highly Stable Amorphous Silicon Hydride as the Product of a Catalytic Helium-Hydrogen Plasma Reaction", *Int. J. Hydrogen Energy*, Vol. 28, No. 12, (2003), pp. 1401-1424.
38. R. Mills, E. Dayalan, P. Ray, B. Dhandapani, J. He, "Highly Stable Novel Inorganic Hydrides from Aqueous Electrolysis and Plasma Electrolysis", *Electrochimica Acta*, Vol. 47, No. 24, (2002), pp. 3909-3926.
19. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", *Int. J. Hydrogen Energy*, Vol. 26, No. 9, (2001), pp. 965-979.
10. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.
9. R. Mills, "Novel Inorganic Hydride", *Int. J. of Hydrogen Energy*, Vol. 25, (2000), pp. 669-683.
8. R. Mills, B. Dhandapani, M. Nansteel, J. He, T. Shannon, A. Echezuria, "Synthesis and Characterization of Novel Hydride Compounds", *Int. J. of Hydrogen Energy*, Vol. 26, No. 4, (2001), pp. 339-367.
7. R. Mills, "Highly Stable Novel Inorganic Hydrides", *Journal of New Materials for Electrochemical Systems*, Vol. 6, (2003), pp. 45-54.

The data and its analysis reported Paper No. 64 is also covered in the published or in-press peer-reviewed articles:

69. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Spectroscopic Characterization of the Atomic Hydrogen Energies and Densities and Carbon Species During Helium-Hydrogen-Methane Plasma CVD Synthesis of Diamond Films", *Chemistry of Materials*, Vol. 15, (2003), pp. 1313-1321.

60. R. L. Mills, J. Sankar, P. Ray, A. Voigt, J. He, B. Dhandapani, "Synthesis of HDLC Films from Solid Carbon", *Journal of Material Science*, Vol. 39, (2004), pp. 3309-3318.

The data and its analysis reported in Paper Nos. 65 and 68 is also covered in the published or in-press peer-reviewed articles:

59. R. Mills, P. Ray, R. M. Mayo, "The Potential for a Hydrogen Water-Plasma Laser", *Applied Physics Letters*, Vol. 82, No. 11, (2003), pp. 1679-1681.

The supporting data and its analysis of Applicant's novel hydrogen chemistry reported in Paper Nos. 70-94 is also covered in the 58 peer-reviewed articles that have already been published.

As the Committee members most certainly should know, the peer review is a rigorous process and, thus, is not instantaneous. Of the more recently submitted articles, the following have now published:

81. R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", *European Physical Journal-Applied Physics*, in press.
77. J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", *Journal of Applied Physics*, Vol. 96, No. 6, pp. 3095-3102.

In light of the foregoing explanations, the Committee is clearly off base in its arbitrary blanket rejection of Applicant's scientific evidence supporting the existence of lower-energy hydrogen as not yet credible or being otherwise invalid. In stating as the basis for its rejection that certain of Applicant's papers "have not yet been published in scientifically qualified journals with appropriate review process," the Committee, once again, makes the case in favor of Applicant that his evidence is in fact valid and credible. Applicant, therefore, repeats prior requests that the Committee give proper weight to Applicant's scientific evidence and, based on this and other evidence of record, that it immediately issue all pending claims in this case.

The Committee's further argument that Applicant's other papers (Nos. 51-52, 54, 56, 59, 67, and 69) "have been published in scientifically qualified journals, but do not

refer to the "hydrino" or to the possible existence of states of a lower-energy atomic hydrogen having fractional energy levels" is also baseless, once again, demonstrating its obvious lack of familiarity with Applicant's evidence.

All of the above-cited articles discuss the reaction of atomic hydrogen to lower energy states and provide further supporting references:

51. R. Mills, P. Ray, R. M. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.
52. R. Mills and M. Nansteel, P. Ray, "Bright Hydrogen-Light Source due to a Resonant Energy Transfer with Strontium and Argon Ions", New Journal of Physics, Vol. 4, (2002), pp. 70.1-70.28.
54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.
56. R. M. Mayo, R. Mills, "Direct Plasmadynamic Conversion of Plasma Thermal Power to Electricity for Microdistributed Power Applications", 40th Annual Power Sources Conference, Cherry Hill, NJ, June 10-13, (2002), pp. 1-4).
59. R. Mills, P. Ray, R. M. Mayo, "The Potential for a Hydrogen Water-Plasma Laser", Applied Physics Letters, Vol. 82, No. 11, (2003), pp. 1679-1681.
67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542.
69. R. L. Mills, J. Sankar, A. Voigt, J. He, B. Dhandapani, "Spectroscopic Characterization of the Atomic Hydrogen Energies and Densities and Carbon Species During Helium-Hydrogen-Methane Plasma CVD Synthesis of Diamond Films", Chemistry of Materials, Vol. 15, (2003), pp. 1313-1321.

Frankly, Applicant is not all that surprised by the Committee's carelessness in reviewing these articles and invalidating them for allegedly not referring to the lower energy states of atomic hydrogen. This lax approach to evaluating Applicant's scientific evidence has been a recurring pattern consistent with its steadfast position that "allowance is not an option" in this and other pending BlackLight applications. Had the Committee properly considered Applicant's evidence, it would have recognized that,

indeed, these articles do refer to such lower energy states and, therefore, must be considered valid and credible by Committee-imposed standards.

For example, in Paper No. 67, there appears the following discussion of the lower energy states of hydrogen:

4. Conclusion

We report that extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \text{ eV}$, $q = 1, 2, 3, 7, 9, 11$. or $q \cdot 13.6 \text{ eV}$, $q = 4, 6, 8$ less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $\text{He}(1s^2)$ to $\text{He}(1s^1 2p^1)$. The authors could find no conventional explanation for the novel series of peaks and are open to suggestions. These lines matched transitions to fractional Rydberg states of atomic hydrogen ($n = \frac{1}{p} = \frac{1}{\text{integer}}$ replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states). An extremely high hydrogen-atom temperature of $180 - 210 \text{ eV}$ was observed with the presence of helium ion catalyst only with hydrogen present. Similarly, the average electron temperature for helium-hydrogen plasma was high, $30,500 \pm 5\% \text{ K}$, compared to $7400 \pm 5\% \text{ K}$ for helium alone.

The novel emission lines and extraordinarily elevated temperatures may be explained by a highly energetic catalytic reaction involving a resonant nonradiative energy transfer of $m \cdot 27.2 \text{ eV}$ from atomic hydrogen to a catalyst wherein m is an integer. One such atomic catalytic system involves helium ions. The second ionization energy of helium is 54.4 eV ; thus, the ionization reaction of He^+ to He^{2+} has a net enthalpy of reaction of 54.4 eV which is equivalent to $2 \cdot 27.2 \text{ eV}$. Since the products of the catalysis reaction have binding energies of $m \cdot 27.2 \text{ eV}$, they may further serve as catalysts.

Similarly, Paper No. 51 provides the following discussion of the lower energy states of hydrogen:

ABSTRACT

Each of the ionization of Rb^+ and cesium and an electron transfer between two K^+ ions (K^+ / K^+) provide a reaction with a net enthalpy of an integer multiple of the potential energy of atomic hydrogen, 27.2 eV . The corresponding Group I nitrates provide these reactants as volatilized ions directly or as atoms by undergoing decomposition or reduction to the corresponding metal. The presence of each of the reactants identified as providing an enthalpy of reaction of an integer of that of the potential energy of atomic hydrogen ($m \cdot 27.2\text{ eV}$) formed a low applied temperature, extremely low voltage plasma called a resonant transfer or rt-plasma having strong vacuum ultraviolet (VUV) emission. In contrast, magnesium and aluminum atoms or ions do not ionize at integer multiples of the potential energy of atomic hydrogen. $Mg(NO_3)_2$ or $Al(NO_3)_3$ did not form a plasma and caused no emission.

For further characterization, we recorded the width of the 6563 \AA Balmer α line on light emitted from rt-plasmas. Significant line broadening of 18, 12, and 12 eV was observed from a rt-plasma of hydrogen with KNO_3 , $RbNO_3$, and $CsNO_3$, respectively, compared to 3 eV from a hydrogen microwave plasma. These results could not be explained by Stark or thermal broadening or electric field acceleration of charged species since the measured field of the incandescent heater was extremely weak, 1 V/cm , corresponding to a broadening of much less than 1 eV . Rather the source of the excessive line broadening is consistent with that of the observed VUV emission, an energetic reaction caused by a resonant energy transfer between hydrogen atoms and K^+ / K^+ , Rb^+ , and cesium, which serve as catalysts.

KNO_3 and $RbNO_3$ formed the most intense plasma. Remarkably, a stationary inverted Lyman population was observed in the case of an rt-plasma formed with potassium and rubidium catalysts. These catalytic reactions may pump a cw HI laser as predicted by laser equations and a collisional radiative model used to determine that the observed overpopulation was above threshold.

4. Conclusion

$2K^+ \rightarrow K + K^{2+}$, $Rb^+ \rightarrow Rb^{2+}$, and $Cs \rightarrow Cs^{2+}$ each provide a reaction with a net enthalpy equal to the potential energy of atomic hydrogen, 27.2 eV , and $K \rightarrow K^{3+}$ provides a reaction with a net enthalpy equal to $3 \cdot 27.2\text{ eV}$. The presence of these gaseous atoms and ions with thermally dissociated hydrogen formed a

plasma having strong VUV emission. Emission was observed from Rb^+ , Rb^{2+} , K , K^+ , K^{2+} , K^{3+} , Cs , Cs^+ , and Cs^{2+} that confirmed the resonant energy transfer with the formation of the corresponding rt-plasma. Emission was also observed from a continuum state of Cs^{2+} at 533 Å. The single emission feature with the absence of the other corresponding Rydberg series of lines from species confirmed the resonant energy transfer of 27.2 eV from atomic hydrogen to atomic cesium.

A stationary inverted Lyman population was observed with potassium and rubidium catalysts. The ionization and population of excited atomic hydrogen levels was attributed to energy provided by the rt-plasma reactions. The high hydrogen atom temperature with a relatively low electron temperature, $T_e < 1$ eV, were characteristic of cold recombining plasmas [6]. These conditions of the rt-plasmas favored an inverted population in the lower levels. Thus, the catalysis of atomic hydrogen may pump a cw HI laser. From our results, laser oscillations are expected between $n = 3$ and $n = 2$.

From these excerpts, it is abundantly clear that, contrary to the Committee's misstatements, the articles in question and the references cited therein most certainly do refer to the reaction of atomic hydrogen to lower energy states. Because the Committee incorrectly invalidated these articles for supposedly failing to make such references, they must now be considered valid and credible according to its own standards. Applicant therefore insists that the Committee give proper weight his scientific evidence supporting the operability of the claimed invention and that it allow all pending claims to issue in this case.

The Committee continues its faulty analysis of Applicant's scientific evidence by mistakenly arguing that:

The only paper that was found to be published in a peer-reviewed journal is reference number 50. And, even here, the refereeing of the journal of Vibrational Spectroscopy is somewhat questionable. This is the only paper that the Examiner sees which correlates the experimental evidence of the spectral analysis as provided by the Applicant with the change in theory which substitutes the fractional integers for the whole integers in the above-mentioned Rydberg equation (see equation no. 1 in the Specification) which would perturb the dimension of the Bohr radius, increase the binding energy, and subsequently demonstrate the existence

of a novel form of a hydrogen species. It is in this paper that the Applicant shows the low energy peaks which he attributes to states of lower-energy atomic hydrogen, and from which the Applicant postulates his theory using fractional principal quantum numbers. However, as mentioned before and as reiterated in the attached appendix, the existence of these very weak peaks can be explained by external contamination or simply by unforeseen experimental error, and should not have lead the Applicant to construe the outlandish claim to the discovery of a new form of hydrogen (the hydrino) along with a theory which tries to explain its existence.

These arguments have no merit whatsoever, once again, confirming the Committee's failure to properly consider Applicant's scientific evidence supporting the existence of lower-energy hydrogen.

First, the journal Vibrational Spectroscopy is an International Journal devoted to Applications of Infrared and Raman Spectroscopy. It is printed by Elsevier, which currently publishes 2118 journals and have published over twenty thousand books. Vibrational Spectroscopy provides a vehicle for the publication of original research in vibrational spectroscopy. It covers infrared, near-infrared and Raman spectroscopies, and publishes papers dealing with developments in applications, theory, techniques and instrumentation. The topics covered by the journal include: Sampling techniques - including diffuse reflectance spectroscopy, reflection-absorption spectroscopy, and photoacoustic spectroscopy; Vibrational spectroscopy coupled with separation techniques; Instrumentation (Fourier transform, conventional and laser based); Data manipulation; Expert systems for identification and structure elucidation; and Spectra-structure correlation and group frequencies. The application areas covered include: Analytical chemistry; Bio-organic and bio-inorganic chemistry; Organic chemistry; Inorganic chemistry; Catalysis; Environmental science; Industrial chemistry; Materials science; Physical chemistry; Polymer science; Process control; and Specialized problem solving. The journal provides its readership with a concise picture of the "state of the art" of vibrational spectroscopy on a regular basis. In order to achieve this goal the journal publishes review articles, news, and book reviews, as well as original research papers and short communications. The referees for this journal are PhD. scientists having a high level of skill in these topics. The Examiner's simple

conclusion that the refereeing of articles in this journal are "somewhat questionable" is completely unfounded and should be withdrawn.

Second the Examiner fails to acknowledge that Applicant has over 50 peer-reviewed published articles demonstrating the operability of Applicant's novel hydrogen chemistry by reporting the reaction of atomic hydrogen with catalysts to form lower-energy hydrogen and release energy as taught by the present application. In addition to article no. 50,

50. R. L. Mills, P. Ray, J. Dong, M. Nansteel, B. Dhandapani, J. He, "Spectral Emission of Fractional-Principal-Quantum-Energy-Level Atomic and Molecular Hydrogen", *Vibrational Spectroscopy*, Vol. 31, No. 2, (2003), pp. 195-213.

several additional peer-reviewed articles have been published that directly show and assign the hydrino spectra lines:

67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", *J. Phys. D, Applied Physics*, Vol. 36, (2003), pp. 1535-1542.

33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", *J Mol. Struct.*, Vol. 643, No. 1-3, (2002), pp. 43-54.

29. R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", *Int. J. Hydrogen Energy*, Vol. 27, No. 5, (2002), pp. 533-564.

28. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", *Int. J. Hydrogen Energy*, (2002), Vol. 27, No. 3, pp. 301-322.

Assignments to known species and contaminants were investigated and ruled out. For example, extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \text{ eV}$, $q = 1, 2, 3, 7, 9, 11$. or $q \cdot 13.6 \text{ eV}$, $q = 4, 6, 8$ less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $\text{He}(1s^2)$ to $\text{He}(1s^1 2p^1)$. These strong emissions are not found in any single gas plasma, and cannot be assigned to the known emission of any species of the single

gases studied such as H , H^- , H_2 , H_2^+ , H_3^+ , He , He_2^* , and He^+ , known species of the mixture such as He_2^+ , HeH^+ , HeH , HHe_2^+ , and HHe_n^+ and He_n , or possible contaminants as given in Ref. #67.

The Committee has obviously overlooked Ref. #67 and the many others submitted by Applicant in addition to #50 on which it so narrowly focuses. In so doing, Committee further fails to recognize that Ref. #67 was published in J. Phys. D, a top-tiered physics journal whose referees extensively peer reviewed the spectra. Nor does it recognize that this published reference unequivocally assigns the lines to hydrino, as explicitly stated in the following excerpts:

The elimination of known explanations indicate a new result. Since the novel peaks were only observed with helium and hydrogen present, new hydrogen, helium, or helium-hydrogen species are possibilities. It is well known that empirically the excited energy states of atomic hydrogen are given by Rydberg equation (Eq. (2a) for $n > 1$ in Eq. (2b)).

$$E_n = -\frac{e^2}{n^2 8\pi\epsilon_0 a_H} = -\frac{13.598 \text{ eV}}{n^2} \quad (2a)$$

$$n = 1, 2, 3, \dots \quad (2b)$$

The $n = 1$ state is the "ground" state for "pure" photon transitions (i.e. the $n = 1$ state can absorb a photon and go to an excited electronic state, but it cannot release a photon and go to a lower-energy electronic state). However, an electron transition from the ground state to a lower-energy state may be possible by a resonant nonradiative energy transfer such as multipole coupling or a resonant collision mechanism. Processes such as hydrogen molecular bond formation that occur without photons and that require collisions are common [47]. Also, some commercial phosphors are based on resonant nonradiative energy transfer involving multipole coupling [48].

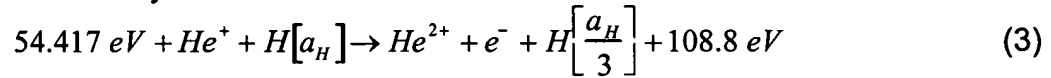
We propose that atomic hydrogen may undergo a catalytic reaction with certain atoms and ions such as He^+ which singly or multiply ionize at integer multiples of the potential energy of atomic hydrogen, $m \cdot 27.2 \text{ eV}$ wherein m is an integer. The theory was given previously [49]. The reaction involves a nonradiative energy transfer to form a hydrogen atom that is lower in energy than unreacted atomic hydrogen that corresponds to a fractional principal quantum number. That is

$$n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}; \quad p \text{ is an integer; } p \leq 137 \quad (2c)$$

replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. Thus, the Rydberg states are extended to lower levels as depicted in Figure 9. The $n = 1$ state of hydrogen and the $n = \frac{1}{\text{integer}}$ states of

hydrogen are nonradiative, but a transition between two nonradiative states is possible via a nonradiative energy transfer, say $n = 1$ to $n = 1/2$. Thus, a catalyst provides a net positive enthalpy of reaction of $m \cdot 27.2 \text{ eV}$ (i.e. it resonantly accepts the nonradiative energy transfer from hydrogen atoms and releases the energy to the surroundings to affect electronic transitions to fractional quantum energy levels). As a consequence of the nonradiative energy transfer, the hydrogen atom becomes unstable and emits further energy until it achieves a lower-energy nonradiative state having a principal energy level given by Eqs. (2a) and (2c).

The novel peaks fit two empirical relationships. In order of energy, the set comprising the peaks at 91.2 nm , 45.6 nm , 30.4 nm , 13.03 nm , 10.13 nm , and 8.29 nm correspond to energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 7, 9, 11$. In order of energy, the set comprising the peaks at 37.4 nm , 20.5 nm , and 14.15 nm correspond to energies of $q \cdot 13.6 - 21.21 \text{ eV}$ where $q = 4, 6, 8$. These lines can be explained as electronic transitions to fractional Rydberg states of atomic hydrogen given by Eqs. (2a) and (2c) wherein the catalytic system involves helium ions because the second ionization energy of helium is 54.417 eV , which is equivalent to $2 \cdot 27.2 \text{ eV}$. In this case, 54.417 eV is transferred nonradiatively from atomic hydrogen to He^+ which is resonantly ionized. The electron decays to the $n = 1/3$ state with the further release of 54.417 eV which may be emitted as a photon. The catalysis reaction is

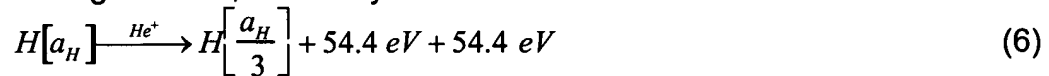


And, the overall reaction is



Since the products of the catalysis reaction have binding energies of $m \cdot 27.2 \text{ eV}$, they may further serve as catalysts. Thus, further catalytic transitions may occur: $n = \frac{1}{3} \rightarrow \frac{1}{4}$, $\frac{1}{4} \rightarrow \frac{1}{5}$, and so on.

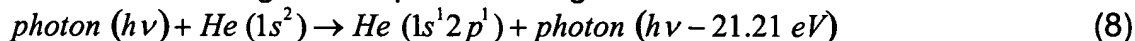
Electronic transitions to Rydberg states given by Eqs. (2a) and (2c) catalyzed by the resonant nonradiative transfer of $m \cdot 27.2 \text{ eV}$ would give rise to a series of emission lines of energies $q \cdot 13.6 \text{ eV}$ where q is an integer. It is further proposed that the photons that arise from hydrogen transitions may undergo inelastic helium scattering. That is, the catalytic reaction



yields 54.4 eV by Eq. (4) and a photon of 54.4 eV (22.8 nm). Once emitted, the photon may be absorbed or scattered. When this photon strikes $\text{He}(1s^2)$, 21.2 eV may be absorbed in the excitation to $\text{He}(1s^1 2p^1)$. This leaves a 33.19 eV (37.4 nm) photon peak and a 21.21 eV (58.4 nm) photon from $\text{He}(1s^1 2p^1)$. Thus, for helium the inelastic scattered peak of 54.4 eV photons from Eq. (3) is given by

$$E = 54.4 \text{ eV} - 21.21 \text{ eV} = 33.19 \text{ eV} \quad (37.4 \text{ nm}) \quad (7)$$

A novel peak shown in Figures 2-4 was observed at 37.4 nm. Furthermore, the intensity of the 58.4 nm peak corresponding to the spectra shown in Figure 4 was about 60,000 photons/sec. Thus, the transition $He(1s^2) \rightarrow He(1s^1 2p^1)$ dominated the inelastic scattering of EUV peaks. The general reaction is



The two empirical series may be combined—one directly from Eqs. (2a, 2c) and the other indirectly with Eq. (8). The energies for the novel lines in order of energy are 13.6 eV, 27.2 eV, 40.8 eV, 54.4 eV, 81.6 eV, 95.2 eV, 108.8 eV, 122.4 eV and 149.6 eV. The corresponding peaks are 91.2 nm, 45.6 nm, 30.4 nm, 37.4 nm, 20.5 nm, 13.03 nm, 14.15 nm, 10.13 nm, and 8.29 nm, respectively. Thus, the identified novel lines correspond to energies of $q \cdot 13.6 \text{ eV}$, $q = 1, 2, 3, 7, 9, 11$, or $q \cdot 13.6 \text{ eV}$, $q = 4, 6, 8$ less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $He(1s^2)$ to $He(1s^1 2p^1)$. The values of q observed are consistent with those expected based on Eq. (5) and the subsequent autocatalyzed reactions as discussed previously [50]. The broad satellite peak at 44.2 nm show in Figure 2-4 is consistent with the reaction mechanism of a nonradiative transfer to a catalyst followed by emission. There is remarkable agreement between the data and the proposed transitions to fractional Rydberg states and these lines inelastically scattered by helium according to Eq. (8). All other peaks could be assigned to He I, He II, second order lines, or atomic or molecular hydrogen emission. No known lines of helium or hydrogen explain the $q \cdot 13.6 \text{ eV}$ related set of peaks.

In addition, the Committee conveniently ignores the fact that the lower-energy hydrogen formed in a helium-hydrogen plasma has been recently isolated as given in:

98. R. L. Mills, Y. Lu, J. He, M. Nansteel, P. Ray, X. Chen, A. Voigt, B. Dhandapani, "Spectral Identification of New States of Hydrogen", New Journal of Chemistry, submitted.
103. R. Mills, B. Dhandapani, W. Good, J. He, "New States of Hydrogen Isolated from K_2CO_3 Electrolysis Gases", Chemical Engineering Science, submitted.

Specifically, article #98 provides:

ABSTRACT

Novel emission lines with energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 4, 6, 7, 8, 9, 11$ were previously observed by extreme ultraviolet (EUV) spectroscopy recorded on microwave discharges of helium with 2% hydrogen [R. L. Mills, P. Ray, J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542]. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen wherein $n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}$;

($p \leq 137$ is an integer) replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. Evidence supports that these states are formed by a resonant nonradiative energy transfer to He^+ acting as a catalyst. Ar^+ also serves as a catalyst to form $H(1/p)$; whereas, krypton, xenon, and their ions serve as controls. $H(1/p)$ may react with a proton and two $H(1/p)$ may react to form $H_2(1/p)^+$ and $H_2(1/p)$, respectively, that have vibrational and rotational energies that are p^2 times those of the species comprising uncatalyzed atomic hydrogen. A series of over twenty peaks in the 10-65 nm region emitted from low-pressure helium-hydrogen (90/10%) and argon-hydrogen (90/10%) microwave plasmas matched the energy spacing of 2^2 times the transition-state vibrational energy of H_2^+ with the series ending on the bond energy of $H_2(1/4)^+$. Rotational lines were observed in the 145-300 nm region from atmospheric pressure electron-beam excited argon-hydrogen plasmas. The unprecedented energy spacing of 4^2 times that of hydrogen established the internuclear distance as $1/4$ that of H_2 and identified $H_2(1/4)$. $H_2(1/p)$ gas was isolated by liquefaction at liquid nitrogen temperature and by decomposition of compounds found to contain the corresponding hydride ions $H^-(1/p)$. The $H_2(1/p)$ gas was dissolved in $CDCl_3$ and characterized by 1H NMR. Considering solvent effects, singlet peaks upfield of H_2 were observed with a predicted integer spacing of 0.64 ppm at 3.47, 3.02, 2.18, 1.25, 0.85, and 0.22 ppm which matched the consecutive series $H_2(1/2)$, $H_2(1/3)$, $H_2(1/4)$, $H_2(1/5)$, $H_2(1/6)$, and $H_2(1/7)$, respectively. Excess power was absolutely measured from the helium-hydrogen plasma. For an input of 41.9 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 62.1 W corresponding to 20.2 W of excess power in 3 cm^3 plasma volume. The excess power density and energy balance were high, 6.7 W/cm^3 and $-5.4 \times 10^4 \text{ kJ/mole } H_2$ (280 eV/H atom), respectively. In addition to power applications, battery and propellant reactions are proposed that may be transformational, and observed excited vibration-rotational levels of $H_2(1/4)$ could be the basis of a UV laser that could significantly advance photolithography.

The Committee's obstacle to understanding the prediction of these transitions from first principle laws of nature, such as Maxwell's equations, is its reliance on the flawed, postulated theory of quantum mechanics, which does not explain the stability of the hydrogen atom or the physical basis of the Rydberg series of lines in the first place. This subject is discussed in the following articles, particularly #80:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", *Physica Scripta*, submitted.

106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", Progress of Physics, submitted.
102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One- Through Twenty-Electron Atoms", Physics Essays, submitted.
94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", Physics Essays, submitted.
80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Fondation Louis de Broglie, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

The Committee further fails to fairly consider the fifty-one independent reports and papers, aside from Applicant's own interpretation of his data, that report experimental evidence of novel energy states corresponding to non-integer or fractional values of n for the hydrogen atom. Applicant will not allow the Committee to dismiss out of hand this considerable body of documentary evidence, which is given in the section entitled "Independent Test Results." As the Committee is unable to rebut the merits of Applicant's overwhelming evidence, Applicant is entitled to have his patent issued.

The Committee's refusal to look beyond its narrow view that clings desperately to antiquated theories over real-world evidence is further exemplified by its arguments appearing on page 4 of the present Office Action:

As to the anomalous hydrogen line broadening recited in the experimental papers and the Applicant's claim that this is evidence of the

lower energy hydrogen, there are many other physically plausible explanations (see Appendix), i.e., pressure broadening (due to high pressure within a hollow cathode), resonance broadening, microwave-field broadening, and many other broadening mechanisms which are fundamentally different than Applicant's "resonance broadening" due to hydrino levels. Thus, even if Applicant's hydrino hypothesis would be assumed as physically plausible, an explanation based on a new hypothesis in the presence of a number of other plausible reasons, is highly speculative. Consequently, the experimental data as presented in the technical papers, fails to convince the Examiner as to the possible existence of a lower-energy atomic hydrogen.

These arguments, like the others posited by the Committee, are easily rebutted. Applicant again notes that his experimental results have been independently reproduced, and the results have been found to only be explicable by energy transfer during the formation of lower-energy hydrogen. From the section entitled "Independent Test Results":

51. J. Phillips, C-K Chen, R. Mills, "Evidence of catalytic Production of Hot Hydrogen in RF Generated Hydrogen/Argon Plasmas", IEEE Transactions on Plasma Science, submitted.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies of line broadening in catalysis plasmas. This is the third in a series of papers by our team on apparently anomalous Balmer series line broadening in hydrogen containing RF generated, low pressure (< 600 mTorr) plasmas. In this paper the selective broadening of the atomic hydrogen lines in pure H₂ and Ar/H₂ mixtures in a large "GEC" cell (36 cm length X 14 cm ID) was mapped as a function of position, H₂/Ar ratio, time, power, and pressure. Several observations regarding the selective line broadening were particularly notable as they are unanticipated on the basis of earlier models. First, the anomalous broadening of the Balmer lines was found to exist throughout the plasma, and not just in the region between the electrodes. Second, the broadening was consistently a complex function of the operating parameters particularly gas composition (highest in pure H₂) position, power and pressure. Clearly not anticipated by earlier models were the findings that under some conditions the highest concentration of "hot" (>10 eV) hydrogen was found at the entry end, and not in the high field region between the electrodes and that in other conditions, the hottest H was at the (exit) pump (also grounded electrode) end. Third, excitation and electron temperatures were less than one eV in all regions of the plasma not directly adjacent (>1mm) to the electrodes, providing additional evidence that the energy for broadening, contrary to standard models, is not obtained from the field. Fourth, in contrast to our earlier studies of hydrogen/helium and water plasmas, we found that in some conditions 98% of the atomic hydrogen was in the "hot" state throughout the GEC cell. Virtually every operating parameter studied impacted the character of the hot H atom population, and

clearly second and third order effects exist, indicating a need for experimental design. Some non-field mechanisms for generating hot hydrogen atoms, specifically those suggested by Mills' CQM model, are outlined.

50. J. Phillips, C. K. Chen, R. Mills, "Evidence of the Production of Hot Hydrogen Atoms in RF Plasmas by Catalytic Reactions Between Hydrogen and Oxygen Species", *Spectrochimica Acta Part B: Atomic Spectroscopy*, submitted.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies of line broadening in catalysis plasmas. Selective H-atom line broadening was found to be present throughout the volume (13.5 cm ID x 38 cm length) of RF generated H_2O plasmas in a GEC cell. Notably, at low pressures (ca. <0.08 Torr), a significant fraction (ca. 20%) of the atomic hydrogen was 'hot' with energies greater than 40 eV with a pressure dependence, but only a weak power dependence. The degree of broadening was virtually independent of the position studied within the GEC cell, similar to the recent finding for He/H_2 plasmas in the same GEC cell. In contrast to the atomic hydrogen lines, no broadening was observed in oxygen species lines at low pressures. Also, in 'control' Xe/H_2 plasmas run in the same cell at similar pressures and adsorbed power, no significant broadening of atomic hydrogen, Xe , or any other lines was observed. Stark broadening or acceleration of charged species due to high electric fields can not explain the results since i) the electron density was insufficient by orders of magnitude, ii) the RF field was essentially confined to the cathode fall region in contrast to the broadening that was independent of position, and iii) only the atomic hydrogen lines were broadened. Rather, all of the data is consistent with a model that claims specific, predicted, species can act catalytically through a resonant energy transfer mechanism to create 'hot' hydrogen atoms in plasmas.

48. J. Phillips, C. K. Chen, "Evidence of Energetic Reaction Between Helium and Hydrogen Species in RF Generated Plasmas", *Philosophy Magazine*, submitted.

A study of the line shapes of hydrogen Balmer series lines in RF generated low pressure H_2/He plasmas performed at the University of New Mexico, Department of Chemical and Nuclear Engineering produced results suggesting a catalytic process between helium and hydrogen species results in the generation of 'hot' (ca. 28 eV) atomic hydrogen. Even far from the electrodes (ca. 15 cm) both 'cold' (<2.5 eV) and 'hot' atomic hydrogen were found in H_2/He plasmas. Line shapes, relative line areas of cold and hot atomic hydrogen (hot/cold>2.5), were very similar for areas between the

electrodes and far from the electrodes for these plasmas. In contrast, in H₂/Xe only 'warm' (<5 eV) hydrogen (warm/cold<1.0) was found between the electrodes, and only cold hydrogen away from the electrodes. Earlier postulates that preferential hydrogen line broadening in plasmas results from the acceleration of ionic hydrogen in the vicinity of electrodes, and the special charge exchange characteristics of Ar/H₂⁺ are clearly belied by the present results that show atomic hydrogen line shape are similar for H₂/He plasmas throughout the relatively large cylindrical (14 cm ID x 36 cm length) cavity.

47. R. L. Mills, P. Ray, M. Nansteel, J. He, X. Chen, A. Voigt, B. Dhandapani, Luca Gamberale, "Energetic Catalyst-Hydrogen Plasma Reaction as a Potential New Energy Source", J. Phys. B: At. Mol. Opt. Phys., submitted.

Luca Gamberale of the Advanced Research - Pirelli Labs, Milan, Italy performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of a chemically generated hydrogen plasma, extraordinarily broadened atomic hydrogen lines, lower-energy hydrogen molecular-ion lines, the isolation and characterization of lower-energy molecular hydrogen gas, and excess power measured by water bath calorimetry were replicated. Specifically, plasmas of certain catalysts such as Sr^+ , Ar^+ , and He^+ mixed with hydrogen were studied for evidence of a novel energetic reaction. A hydrogen plasma was observed to form at low temperatures (e.g. $\approx 10^3$ K) and an extraordinary low field strength of about 1-2 V/cm when argon and strontium were present with atomic hydrogen. RF and microwave plasmas were used to generate He^+ and Ar^+ catalysts. Extraordinarily fast H (40-50 eV) was observed by Balmer α line broadening only from plasmas having a catalyst with H. Novel emission lines with energies of $q \cdot 13.6$ eV where $q = 1, 2, 3, 4, 6, 7, 8, 9$, or 11 were previously observed by extreme ultraviolet (EUV) spectroscopy recorded on microwave discharges of helium with 2% hydrogen [R. L. Mills, P. Ray, J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542]. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen wherein $n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}$; ($p \leq 137$ is an integer) replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. $H(1/p)$ may react with a proton and two $H(1/p)$ may react to form $H_2(1/p)^+$ and $H_2(1/p)$, respectively, that have vibrational and rotational energies that are p^2 times those of the species comprising uncatalyzed atomic hydrogen. A series of over twenty peaks in the 10-65 nm region emitted from low-pressure helium-hydrogen (90/10%) and argon-hydrogen (90/10%) microwave

plasmas matched the energy spacing of 2^2 times the transition-state vibrational energy of H_2^+ with the series ending on the bond energy of $H_2(1/4)^+$. $H_2(1/p)$ gas was isolated by liquefaction using an high-vacuum (10^{-6} Torr) capable, liquid nitrogen cryotrap and was characterized by gas chromatography (GC), mass spectroscopy (MS), visible and EUV optical emission spectroscopy (OES), and 1H NMR of the condensable gas dissolved in $CDCl_3$. Novel peaks were observed by cryogenic gas chromatography performed on the condensable gas which was highly pure hydrogen by MS and had a higher ionization energy than H_2 . The observation that the EUV emission spectrum changed with deuterium substitution in a region where no hydrogen emission has ever been observed further supported the existence of lower-energy molecular hydrogen. Contaminants and exotic helium-hydrogen species were eliminated as the source of the reaction and condensed gas plasma emission spectra. Upfield shifted NMR peaks were observed at 3.47 ppm and 2.18 ppm compared to that of H_2 at 4.63 ppm that matched $H_2(1/2)$ and $H_2(1/4)$, respectively. Excess power was absolutely measured from the helium-hydrogen plasma. For an input of 44.3 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 62.9 W corresponding to 18.6 W of excess power in 3 cm^3 . The excess power density and energy balance were high, 6.2 W/cm^3 and $-5 \times 10^4\text{ kJ/mole } H_2$ (240 eV/H atom), respectively.

44. **A. J. Marchese, P. M. Jansson, J. L. Schmalzel, "The BlackLight Rocket Engine", Phase I Final Report, NASA Institute for Advanced Concepts Phase I, May 1-November 30, 2002,**
http://www.niac.usra.edu/files/studies/final_report/pdf/752Marchese.pdf.

Rowan University Professors A. J. Marchese, P. M. Jansson, J. L. Schmalzel performed verification studies as visiting researchers at BlackLight Power, Cranbury, NJ. The prior reported results of BlackLight Power, Inc. of extraordinarily broadened atomic hydrogen lines, population inversion, lower-energy hydrogen lines, and excess power measured by water bath calorimetry were replicated. The application of the energetic hydrogen to propulsion was studied.

Specifically, the data supporting hydrinos was replicated. See

i.) BlackLight Process Theory (pp. 10-12) which gives the theoretical energy levels for hydrinos and the catalytic reaction to form hydrinos,

ii.) Unique Hydrogen Line Broadening in Low Pressure Microwave Water Plasmas (pp. 25-27, particularly Fig. 21) which shows that in the same microwave cavity driven at the same power, the temperature of the hydrogen atoms in the microwave

plasma where the hydrino reaction was active was 50 times that of the control based on the spectroscopic line widths,

iii.) Inversion of the Line Intensities in Hydrogen Balmer Series (pp. 27-28, particularly Fig. 22) which shows for the first time in 40 years of intensive worldwide research that atomic hydrogen population inversion was achieved in a steady state plasma and supports the high power released from the reaction of hydrogen to form hydrinos,

iv.) Novel Vacuum Ultraviolet (VUV) Vibration Spectra of Hydrogen Mixture Plasmas (pp. 28-29, particularly Fig. 23) which shows a novel vibrational series of lines in a helium-hydrogen plasmas at energies higher than any known vibrational series and it identically matches the theoretical prediction of 2 squared times the corresponding vibration of the ordinary hydrogen species, and

v.) Water Bath Calorimetry Experiments Showing Increased Heat Generation (pp. 29-30, particularly Fig. 25) that shows that with exactly the same system and same input power, the heating of the water reservoir absolutely measured to 1% accuracy was equivalent to 55 to 62 W with the catalyst-hydrogen mixture compared to 40 W in the control without the possibility of the reaction to form hydrinos.

43. J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", *Journal of Applied Physics*, Vol. 96, No. 6, pp. 3095-3102.

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. Water bath calorimetry was used to demonstrate one more peculiar phenomenon associated with a certain class of mixed gas plasmas termed resonant transfer, or rt-plasmas. Specifically, He/H_2 (10%) (500 mTorr), Ar/H_2 (10%) (500 mTorr), and $H_2O(g)$ (200 mTorr) plasmas generated with an Evenson microwave cavity consistently yielded on the order of 50% more heat than non rt-plasma (controls) such as He , Kr , Kr/H_2 (10%), under identical conditions of gas flow, pressure, and microwave operating conditions. The excess power density of rt-plasmas was of the order $10\ W \cdot cm^{-3}$. In earlier studies with these same rt-plasmas it was demonstrated that other unusual features were present including dramatic broadening of the hydrogen Balmer series lines, unique vacuum ultraviolet (VUV) lines, and in the case of water plasmas, population inversion of the hydrogen excited states. Both the current results and the earlier results are completely consistent with the existence of a hitherto unknown exothermic chemical reaction, such as that predicted by Mills, occurring in rt-plasmas.

42. **R. L. Mills, P. C. Ray, R. M. Mayo, M. Nansteel, B. Dhandapani, J. Phillips, "Spectroscopic Study of Unique Line Broadening and Inversion in Low Pressure Microwave Generated Water Plasmas", J. Plasma Phys., submitted.**

J. Phillips, Distinguished National Laboratory Professor at Los Alamos National Laboratory and University of New Mexico, performed verification studies as a visiting researcher at BlackLight Power, Cranbury, NJ. It was demonstrated that low pressure (~ 0.2 Torr) water vapor plasmas generated in a 10 mm ID quartz tube with an Evenson microwave cavity show at least two features which are not explained by conventional plasma models. First, significant ($> 2.5 \text{ \AA}$) hydrogen Balmer α line broadening was recorded, of constant width, up to 5 cm from the microwave coupler. Only hydrogen, and not oxygen, showed significant line broadening. This feature, observed previously in hydrogen-containing mixed gas plasmas generated with high voltage DC and RF discharges was explained by some researchers to result from acceleration of hydrogen ions near the cathode. This explanation cannot apply to the line broadening observed in the (electrodeless) microwave plasmas generated in this work, particularly at distances as great as 5 cm from the microwave coupler. Second, dramatic inversion of the line intensities of both the Lyman and Balmer series, again, at distances up to 5 cm from the coupler were observed. The dramatic line inversion suggests the existence of a hitherto unknown source of pumping of the optical power in plasmas. Finally, it is notable that other aspects of the plasma including the OH^* rotational temperature and low electron concentrations are quite typical of plasmas of this type.

The broadening reported in the Examiner's reference [5] URL: <http://www.phys.tue.nl/FLTPD/Luggenhoelscher.pdf> is 0.37 cm^{-1} with no field and 3.7 cm^{-1} with the application of the microwave field. The energies corresponding to these widths are $4.5 \times 10^{-5} \text{ eV}$ and $4.5 \times 10^{-4} \text{ eV}$, respectively, which is absolutely negligible compared to the $>10 \text{ eV}$ hot H found in rt-plasmas. The microwave field can not explain Applicant's results.

The common mechanisms that the Committee cites as "plausible explanations" for the anomalous hydrogen line broadening were considered and eliminated as negligible. Yet it refuses to consider, much less acknowledge, that experimental data. For example, from #49, R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355:

We have assumed that Doppler broadening due to thermal motion was the dominant source to the extent that other sources may be neglected. To justify this assumption, each source is now considered. In general, the experimental profile is a convolution of a Doppler profile, an instrumental profile, the natural (lifetime) profile, Stark profiles, Van der Waals profiles, a resonance profile, and fine structure. The instrumental half-width is measured to be $\pm 0.006 \text{ nm}$. The natural half-width of the Balmer α line given by Djurovic and Roberts [10] is $1.4 \times 10^{-4} \text{ nm}$ which is negligible. The fine structure splitting is also negligible.

Stark broadening of hydrogen lines in plasmas can not be measured at low electron densities using conventional emission or absorption spectroscopy because it is hidden by Doppler broadening. In the case of the Lyman α line, the Stark width exceeds the Doppler width only at $n_e > 10^{17} \text{ cm}^{-3}$ for temperatures of about 10^4 K [34]. Gigosos and Cardenoso [35] give the observed Balmer α Stark broadening for plasmas of hydrogen with helium or argon as a function of the electron temperature and density. For example, the Stark broadening of the Balmer α line recorded on a $H + He^+$ plasma is only 0.033 nm with $T_e = 20,000 \text{ K}$ and $n_e = 1.4 \times 10^{14} \text{ cm}^{-3}$.

The relationship between the Stark broadening $\Delta\lambda_s$ of the Balmer β line in nm , the electron density n_e in m^{-3} , and the electron temperature T_e in K is

$$\log n_e = C_0 + C_1 \log(\Delta\lambda_s) + C_2 [\log(\Delta\lambda_s)]^2 + C_3 \log(T_e) \quad (5)$$

where $C_0 = 22.578$, $C_1 = 1.478$, $C_2 = -0.144$, and $C_3 = 0.1265$ [36]. From Eq. (5), to get a Stark broadening of only 0.1 nm with $T_e = 9000 \text{ K}$, an electron density of about $n_e \sim 3 \times 10^{15} \text{ cm}^{-3}$ is required, compared to that of the argon-hydrogen plasma of $< 10^9 \text{ cm}^{-3}$ determined using a compensated Langmuir probe, over six orders of magnitude less. Regional maxima in electron densities that could give rise to Stark broadening was eliminated as a possibility. The measured electron densities did not exceed 10^9 cm^{-3} , and the axial variation was weak, showing less than a factor of two change throughout the brightest region of the plasma. The high mass diffusivity of all of the species present made it unlikely that a large density gradient existed anywhere in the plasma at steady state. This result was also evident by the good fit to a Gaussian profile recorded on the argon-hydrogen plasma rather than a Voigt profile as shown in Figure 10. In addition, the line broadening for Balmer β , γ , and δ was comparable to that of Balmer α ; whereas, an absence of broadening beyond the instrument width was observed for the lines of argon or helium species such as the 667.73 nm and 591.2 nm Ar I lines and 667.816 nm and 587.56 nm He I lines. Thus, the Stark broadening was also insignificant.

A linear Stark effect arises from an applied electric field that splits the energy level with principal quantum number n into $(2n - 1)$ equidistant sublevels. The magnitude of this effect given by Videnovic et al. [8] is about $2 \times 10^{-2} \text{ nm} / \text{kV} \cdot \text{cm}^{-1}$. No appreciable applied electric field was present in our study; thus, the linear Stark effect should be negligible. The absence of

broadening of the noble gas lines and the hydrogen lines of the controls confirmed the absence of a strong electric field. No charged resonator cavity surfaces were present since the plasmas was contained in a quartz tube with the cavity external to the tube. A microwave E-mode field does exist in the Evenson cavity that is a function of the reflected power [37-38], and the catalysis reaction is dependent on this field as discussed previously [39]. However, there is no cathode fall region and the magnitude of the microwave field is comparably much less than that found in the cathode fall region of a glow discharge cell.

To investigate whether the rt-plasmas of this study were optically thin or thick at a given frequency ω , the effective path length $\tau_{\omega}(L)$ was calculated from

$$\tau_{\omega}(L) = \kappa_{\omega} L \quad (5)$$

where L is the path length and κ_{ω} is the absorption coefficient given by

$$\kappa_{\omega} = \sigma_{\omega} N_H \quad (7)$$

where σ_{ω} is the absorption cross section and N_H is the number density of the absorber. For optically thin plasmas $\tau_{\omega}(L) < 1$, and for optically thick plasmas $\tau_{\omega}(L) > 1$. The absorption cross section for Balmer α emission is $\sigma = 1 \times 10^{-16} \text{ cm}^2$ [40]. By methods discussed previously [41-42], an estimate of the n=2 H atom density based on Lyman line intensity is $\sim 1 \times 10^8 \text{ cm}^{-3}$. Thus, for a plasma length of 5 cm, $\tau_{\omega}(5 \text{ cm})$ for Balmer α is

$$\tau_{\omega}(5 \text{ cm}) = \kappa_{\omega} L = (1 \times 10^{-16} \text{ cm}^2)(1 \times 10^8 \text{ cm}^{-3})(5 \text{ cm}) = 5 \times 10^{-8} \quad (8)$$

Since $\tau_{\omega}(5) \ll 1$, the argon-hydrogen plasmas were optically thin; so, the self absorption of 656.3 nm emission by n=2 state atomic hydrogen may be neglected as a source of the observed broadening.

As discussed above, an estimate based on emission line profiles places the total H atom density of the argon-hydrogen plasma at $\sim 3.5 \times 10^{14} \text{ cm}^{-3}$. Since this is overwhelmingly dominated by the ground state, $N_H = 3.5 \times 10^{14} \text{ cm}^{-3}$ will be used. Usually, the atomic hydrogen collisional cross section in plasmas is on the order of 10^{-18} cm^2 [43]. Thus, for $N_H = 3.5 \times 10^{14} \text{ cm}^{-3}$, collisional or pressure broadening is negligible.

The Committee's failure to rebut this and other convincing evidence submitted by Applicant supporting the existence of lower-energy hydrogen requires issuance of all claims in this case.

The final argument presented on page 5 of the main body of the present Office Action is likewise seriously flawed:

However, not only is the hydrino hypothesis highly speculative, but physically wrong, because it is based on many misunderstandings of conventional quantum mechanics, electromagnetic theory and the theory of relativity, as pointed out in detail in the Appendix.

The fundamental errors contained in the Souw Appendix referred to by the Committee are legion and are detailed in Applicant's corresponding Appendix (attached). Suffice it to say here, in summary, that as given in Ref. 1, the following experimental observables given in handbooks and the scientific literature are calculated by Applicant in closed-form exact equations, with no adjustable parameters, by correctly using physical laws:

Table 1. Partial List of Physical Phenomena Solved by CQM.

<ul style="list-style-type: none"> • Stability of the atom to radiation • Magnetic moment of a Bohr magneton and relativistic invariance of each of $\frac{e}{m_e}$ of the electron, the electron angular momentum of \hbar, and the electron magnetic moment of μ_B from the spin angular momentum • Stern Gerlach experiment • Electron and muon g factors • Rotational energies and momenta • Reduced electron mass • Ionization energies of one-electron atoms • Special relativistic effects • Excited states • Resonant line width and shape • Selection rules • Correspondence principle • Orbital and spin splitting • Stark effect • Lamb Shift • Knight shift • Spin-orbital coupling (fine structure) • Spin-nuclear coupling (hyperfine structure) • Hyperfine structure interval of muonium • Nature of the free electron • Nature of the photon • Photoelectric effect 	<ul style="list-style-type: none"> • Compton effect • Wave-particle duality • Double-slit experiment for photons and electrons • Davisson Germer experiment • Elastic electron scattering from helium atoms • Ionization energies of multielectron atoms • Hydride ion binding energy and absolute NMR shift • Excited states of the helium atom • Proton scattering from atomic hydrogen • Nature of the chemical bond • Bond energies, vibrational energies, rotational energies, and bond distances of hydrogen-type molecules and molecular ions, absolute NMR shift of H_2 • Superconductivity and Josephson junction experiments • Integral and fractional quantum Hall effects • Aharonov-Bohm effect • Aspect experiment • Durr experiment on the Heisenberg Uncertainty Principle • Penning trap experiments on single ions • Hyperfine structure interval of positronium • Magnetic moments of the nucleons • Beta decay energy of the neutron • Binding energy of deuterium • Alpha decay
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Table 2. Partial List of Particle and Cosmological Phenomena Solved by CQM.

• Deflection of light by stars	• Power spectrum of the universe
• Precession of the perihelion of Mercury	• Microwave background temperature
• Lepton masses	• Uniformity of the microwave background radiation
• Quark masses	• Microkelvin spatial variation of the microwave background radiation measured by DASI
• Hubble constant	• Polarization of DASI data
• Age of the universe	• Observed violation of the GZK cutoff
• Observed acceleration of the expansion	• Mass density of the universe
• Power of the universe	• Large scale structure of the universe

These unprecedented results, as well as the fatal flaws of quantum theory, stand un rebutted, and are given in:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", Physica Scripta, submitted.
106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", Progress of Physics, submitted.
102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", Physics Essays, submitted.
94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", Physics Essays, submitted.
80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Fondation Louis de Broglie, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

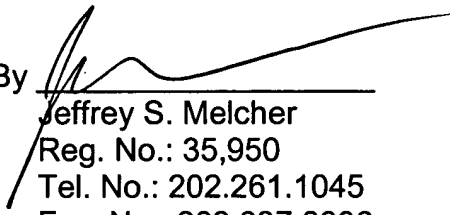
The prediction of the lower-energy states of hydrogen also arises directly from Maxwell's equations as given in Chp 5 of Ref. 1.

Once again, Applicant has shown the Committee's limited analysis of but a small portion of his scientific evidence to be superficial at best. Because of these analytical shortcomings, the Committee has failed to even come close to rebutting the overwhelming body of scientific evidence submitted by Applicant demonstrating the existence of lower energy states of hydrogen.

Conclusion

For the foregoing reasons, Applicant respectfully submits that the subject application fully satisfies the legal requirements of 35 U.S.C. §§ 101 and 112, first paragraph, and is therefore in condition for allowance. A Notice to that affect is earnestly solicited.

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Journal and Recent Book Publications

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106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium which Predicts Conjugate Parameters from a Unique Solution for the First Time," *Progress in Physics*, submitted. (*Web Publication Date: July 30, 2004.*)
105. J. Phillips, C. K. Chen, R. L. Mills, "Evidence of Catalytic Production of Hot Hydrogen in RF-Generated Hydrogen/Argon Plasmas," *IEEE Transactions on Plasma Science*, submitted. (*Web Publication Date: Sept. 7, 2004.*)
104. R. L. Mills, Y. Lu, M. Nansteel, J. He, A. Voigt, W. Good, B. Dhandapani, "Energetic Catalyst-Hydrogen Plasma Reaction as a Potential New Energy Source," Division of Fuel Chemistry, Session: Advances in Hydrogen Energy, 228th American Chemical Society National Meeting, August 22–26, 2004, Philadelphia, PA.
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46. J. He, R. Mills, "TOF-SIMS and XPS Studies of Highly Stable Silicon Hydride Films" (Inorganic/Solid State Session), June 9, 2003, 36th Middle Atlantic Regional Meeting of American Chemical Society, (June 8–11, 2003), Princeton University, Princeton, NJ.
45. B. Dhandapani, R. Mills, "Low Power MPCVD Synthesis and Characterization of Diamond Films on Silicon Substrates" (Inorganic/Solid State Session), June 9, 2003, 36th Middle Atlantic Regional Meeting of American Chemical Society, (June 8–11, 2003), Princeton University, Princeton, NJ.
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7. R. Mills, "Novel Hydride Compound," National Hydrogen Association, 11 th Annual U.S. Hydrogen Meeting, Vienna, VA, (February 29-March 2, 2000).
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5. R. Mills, J. Dong, Y. Lu, J. Conrads, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts," 1999 Pacific Conference on Chemistry and Spectroscopy and the 35th ACS Western Regional Meeting, Ontario Convention Center, California, (October 6-8, 1999).
 4. R. Mills, "Novel Hydride Compound," 1999 Pacific Conference on Chemistry and Spectroscopy and the 35th ACS Western Regional Meeting, Ontario Convention Center, California, (October 6-8, 1999).
3. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride," 1999 Pacific Conference on Chemistry and Spectroscopy and the 35th ACS Western Regional Meeting, Ontario Convention Center, California, (October 6-8,

1999).

2. R. Mills, J. He, and B. Dhandapani, "Novel Hydrogen Compounds," 1999 Pacific Conference on Chemistry and Spectroscopy and the 35th ACS Western Regional Meeting, Ontario Convention Center, California, (October 6-8, 1999).
1. R. Mills, "Excess Heat Production by the Electrolysis of an Aqueous Potassium Carbonate Electrolyte," August 1991 meeting of the American Chemical Society, NY, NY.



APPENDIX

Response to Bernard E. Souw Appendix Attached to March 29, 2004 Office Action in U.S. App'n Ser. No. 09/513,768

The anonymous group of PTO officials and other unknown members that constitute the Secret Committee responsible for handling this and other BlackLight applications relied heavily on arguments presented by Examiner Souw in an Appendix attached to the Advisory Action dated May 7, 2003. [Souw I Appendix] Applicant responded by filing his own Appendix that raised points discrediting those arguments and further highlighting the Committee's failure to seriously consider Applicant's scientific evidence proving the existence of lower-energy hydrogen. Many of those points stand unrebutted and, therefore, weigh heavily in favor of allowing the pending claims in this case to issue.

In an attempt to counter a few of those points, the Committee now responds with additional arguments presented by Examiner Souw in another Appendix attached to the present Office Action, which still does little to advance the prosecution of this application. [Souw II Appendix] To the contrary, these newly presented arguments expose an even greater disregard for Applicant's scientific evidence, in which Examiner Souw: (1) misstates proper standards for evaluating that evidence, thereby unfairly creating new standards; (2) misinterprets experimental data (even misreading a simple figure); and (3) misunderstands basic scientific concepts resulting in the improper invalidation of Applicant's evidence, such as his XPS and water bath calorimetry data.

Applicant's discussion herein tracks all of these arguments and rebuts them point by point, calling into question the extent to which his scientific evidence has received a fair hearing. From this discussion, it is clear that the Examiner, unable to refute that evidence on scientific grounds, resorts to mere hand waving to dismiss the data.

Concerns that Applicant's supporting evidence was being improperly dismissed were raised right from the start in Examiner Souw's introductory

paragraph, which nullifies PTO standards governing the consideration of that evidence:

Regarding Applicant's remark in RCE page 10 of 68, reciting "new standards imposed by the PTO on evaluating the credibility of Applicant's technical papers", it is to be emphasized that there is **no** "new standard" applied in this patent examination: Applicant's invention is deemed incredible under 35 U.S.C. §101 for violating known laws of nature, and therefore, the burden is on Applicant's side to establish credibility, either by hard evidence, i.e., a working prototype device, or by credible and reliable supports, i.e., peer-reviewed publications in refereed scientific journals. This 35 U.S.C. §101 is not at all an "arbitrary" standard, as alleged by Applicant on pp. 7-8 of the RCE, but a fundamental law that sets a standard for patent examination (see MPEP 706.03(a)). [Appendix page 1 (emphasis in original)]

Amazingly, in the same breadth that the Examiner claims no new standard is being applied in this case, he then deems Applicant's invention "incredible" under section 101 for supposedly violating known laws of nature contrary to established PTO standards. The Examiner then argues that the burden is on Applicant to establish credibility. The problems with this rather novel argument are two-fold.

First, the Examiner does apply a new standard in this case as it contradicts long-established procedures for evaluating whether a claimed invention satisfies the utility requirements of 35 U.S.C. § 101. PTO procedures outlined in MPEP § 2107 clearly mandate that examiners refrain from deeming an asserted utility to be *per se* incredible:

[The Examiner] should not begin an evaluation of utility by assuming that an asserted utility is likely to be false, based on the technical field of the invention or for other general reasons. . . . A conclusion that an asserted utility is incredible can be reached only after the Office has evaluated both the assertion of the applicant regarding utility and any evidentiary basis of that assertion. The [Examiner] should be particularly careful not to start with a presumption that an asserted utility is, *per se*, "incredible" and then proceed to base a rejection under 35 U.S.C. 101 on that presumption.

In applying the Section 101 rejection in this case, the PTO violates this mandate by improperly presuming the formation of lower-energy hydrogen as disclosed in the present application is *per se* incredible, while ignoring the bulk of Applicant's supporting scientific evidence.

Second, the express reason given for the Examiner's ill-advised statement that "Applicant's invention is deemed incredible under 35 U.S.C. §101 for violating known laws of nature," is baseless. Throughout the prosecution of his cases, Applicant has pointed out the fallacy of that position, noting that not only is no law of nature violated by Applicant's invention, but that no law has ever been cited.

The reason is obvious: the central feature of Applicant's quantum theory is that all particles, from the atomic to macroscopic level, obey the same physical laws. The PTO's failure to come to grips with this simple concept is troubling, as is its refusal to acknowledge that quantum theory is just that—a theory, not a law of nature. The present record is replete with examples demonstrating how quantum theory has been overhauled throughout its history in a failed attempt to force fit its distorted view of reality. More to the point, since quantum theory violates Maxwell's equations, special relativity, causality, and many other physical laws, by the Examiner's own admission it is invalid.

In view of the foregoing argument, the Examiner's conclusion that "the burden is on Applicant's side to establish credibility" is misplaced and should be withdrawn so that this application can be allowed to issue.

Even if it were assumed Applicant had that burden—which he does not—the Examiner strains credibility in arguing that, to meet it, Applicant must submit "hard evidence, i.e., a working prototype device, or by credible and reliable supports, i.e., peer-reviewed publications in refereed scientific journals." To make that argument, the PTO must ignore clearly established facts in this case, namely that

- (1) Applicant does have a working prototype device—indeed, many such devices—that can be observed at BlackLight Power's 53,000 square foot laboratory facility in Cranbury, New Jersey;
- (2) the PTO has refused to accept—or even to acknowledge for that matter—Applicant's numerous invitations to visit BlackLight's facility to observe and evaluate these working prototypes; and
- (3) Applicant has now submitted "credible and reliable supports," i.e., over 50 "peer-reviewed publications in refereed scientific journals."

The PTO's lack of familiarity with these basic facts, which have been presented in numerous prior responses, is stunning. While the Examiner assumes that Applicant's claimed invention is *per se* incredible and creates new standards that unfairly place the burden on Applicant to submit a working prototype device and peer-reviewed publications in refereed scientific journals, Applicant nonetheless continues to submit such "hard evidence." The problem lies in the PTO's absolute refusal to properly consider it. Had the PTO done so, it would have realized by now that its unfairly imposed standards have already been met.

The PTO also misses the point that, in promoting these new standards, it admits by implication that Applicant's data and theory are confirmed by publication in qualified peer-reviewed journal articles and, therefore Applicant is entitled to his patent. Unfortunately, the pattern is all too clear: each time Applicant meets a newly applied standard, the PTO then raises the bar by setting yet another, thus assuring that "allowance is not an option" in this case as communicated by former Examiner Langel.

The PTO also applies "double standards" in its arbitrary approach to examination. Nothing makes this point clearer than the following statement on pages 1-2 of the Souw II Appendix:

Applicant's further remarks on pg. 10, that "*it is only fair that the reference materials cited by Examiner Souw in the Appendix attached to the May 7 Advisory Action be subjected to the same standards*", then setting forth in pp. 11-12 that technical papers, cited from the journal *Physica* are "*not more scientifically qualified with appropriate review process than the journals that published Applicant's papers*" is again unpersuasive. The journal *Physica* is a refereed journal, published by the reputable and widely known European publisher, Elsevier, which also publishes about 100 other scientific journals. [Emphasis in original.]

The point Applicant was making is simply this: if the Examiner refuses to assign proper validity and credibility to Applicant's peer-reviewed publications in refereed scientific journals, then it stands to reason that technical papers he cites from the journal *Physica* are "not more scientifically qualified with appropriate review process than the journals that published Applicant's papers." It is simply unfair to impose a double standard that views only the PTO's cited peer-reviewed journal articles as valid and credible, but not those cited by Applicant.

What is astonishing is that the Examiner makes Applicant's point even stronger in defending the journal *Physica* as being a "refereed journal" published by a "reputable and widely known" publisher. Applicant has submitted over 50 peer-reviewed journal articles in reputable publications, yet the PTO concludes in a sweeping dismissal of that evidence that those publications are not valid and credible. These arbitrary double standards have no place in the examination process, yet the PTO keeps imposing such standards.

The further statement on page 2 of the Souw II Appendix is just another example:

Applicant's further remark that "*many of the reference materials cited by Examiner Souw in his Appendix to the May 7 2003 Advisory Action have not been published in accredited journals and/or "most certainly" have not been peer-reviewed*", is untrue. Only 2 out of 13 references are not peer reviewed, i.e., refs. (1) and (12), and their citation is justified as follows:

Ref. (1), regarding the He-II 304? line, is just one example out of an overwhelmingly large number of other (refereed) publications. The He-II 304? line is a very well known spectral line routinely measured in many observations, so that one example is here sufficient. Furthermore, the line is also listed in many special tables.

Ref. (12) may be simply discarded, since it has very little relevance. This means, the last sentence in lines 7-8 on page 12 of the May 7 Appendix may be omitted without any consequence.

Again, the Examiner misses the point entirely. The issue here is not the precise number of unpublished references the Examiner has relied upon to reject Applicant's claims. The issue is whether he should be allowed to rely on documentary evidence that does not rise to the same standard imposed on Applicant requiring "credible and reliable supports, i.e., peer-reviewed publications in refereed scientific journals," which standard Applicant has more than satisfied.

The rationale given by the Examiner for imposing this obvious "double standard" would be amusing if it didn't seriously prejudice Applicant's patent rights. For instance, as documented above, Dr. Peter Zimmerman has admitted his inherent biases and lack of competence that prevent him from fairly evaluating Applicant's novel hydrogen technology. Yet, the Examiner still justifies using comments posted by Zimmerman to an Internet bulletin board to reject Applicant's claims in this case:

Regarding Dr. P. Zimmerman's allegedly non-peer-reviewed paper, Applicant's own explanation on page 10 sufficiently provides his acknowledgment that the paper is well reviewed, not just by a few referees, but by the scientific community. Other non-journal references cited in the May 7 Appendix are official publications of reputable universities and institutes, such that dismissing them would automatically dismiss the issuing institutions. [Souw II Appendix at p. 2.]

This argument makes absolutely no sense. Nothing in Applicant's explanation on page 10 provides any acknowledgement that Dr. Zimmerman's

paper was well reviewed by the scientific community. His paper was never modified based on any peer review comments. Nor has it ever been published by any peer-reviewed journal. Thus, under the PTO's new patentability standards, this paper is not a "credible and reliable support" and is crushed under the weight of Applicant's overwhelming credible and reliable evidence reflected in over 50 published peer-reviewed articles.

Furthermore, on the merits, the Zipeerman paper is fatally flawed. For example, it states that the orbitsphere (Applicant's solution for the $n=1$ state of atomic hydrogen) can not be stable to radiation according to the Haus condition. Applicant, however, has shown that the orbitsphere is in fact stable to radiation using the Haus condition in the publication:

58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press

which, unlike Zimmerman's paper, was extensively peer reviewed. It is further shown in:

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

It is also shown in these references by application of the Poynting Power Vector. In fact, it is trivial to show that the Zimmerman paper is flawed. The electron equation for $n=1$ is electrostatic and magnetostatic according to Applicant's theory. The corresponding charge and current are time independent; thus, there can be no radiation.

The Zimmerman criticism is also flawed in that it states that the Haus condition [H. A. Haus, "On the radiation from point charges", American Journal of Physics, 54, (1986), pp. 1126-1129] does not apply to accelerating particles, rather only particles at constant velocity. It is obvious that Zimmerman is wrong, as shown in the following exemplary sections: 1.) Sec. I (top of RHC): " $\omega \vec{J}_1$ can

now be interpreted as containing the acceleration"; 2.) Sec IV: The reason for the radiation of an accelerated charge is that the Fourier components that are "synchronous" with light velocity, i.e. with the propagation constant $|\vec{k}| = \omega / c$.

Thus, for example, an oscillating charge

$$\mathbf{r}_0(t) = \mathbf{d} \sin \omega_0 t,$$

has a Fourier spectrum

$$\mathbf{J}(\mathbf{k}, \omega) = \frac{q \omega_0 d}{2} J_m(k \cos \theta d) \{ \delta[\omega - (m+1)\omega_0] + \delta[\omega - (m-1)\omega_0] \}$$

where J_m 's are Bessel functions of order m . These Fourier components can, and do, acquire phase velocities that are equal to the velocity of light; and 3.) Sec. VII: Thus, one could interpret the expression $\bar{E}_\perp(\vec{r}, \omega)(d\omega / 2\pi)$ as cause by acceleration. The Zimmerman criticism cited by the Examiner misses the entire point of the Haus paper and shows Zimmerman's carelessness and lack of scientific skills. The Examiner should be more careful in his selection of "refutations" of Applicant's sound scientific work.

The Zimmerman paper is therefore not only an unreliable source pursuant to new PTO standards, but is further discredited on the merits.

In addition to setting new standards, the PTO mischaracterizes the record in this case to deny Applicant his patent, as demonstrated by its argument on page 3 of the Appendix:

Contrary to Applicant's allegation on pg. 13, 1st full paragraph, lines 2-4, the PTO's view is not at all that the existence of lower-energy hydrogen were impossible, but instead, that (a) Applicant's invention is not supported by any experimental fact or evidence, and (b) the underlying theory (i.e., GUT/CQM) fails to support the invention, because it contains too many flaws. A few of such flaws have been already exposed in the May 7 Appendix, none of which have been persuasively argued or refuted by Applicant in the RCE as will be demonstrated in the next section(s).

This argument is wrong on two counts. First, the PTO has explicitly stated in prior Office Actions that the existence of lower-energy hydrogen is impossible. In addition, the PTO has consistently argued to this day that Applicant's lower-

energy hydrogen violates laws of nature and science, i.e. is impossible, and cited Dr. Park's statement that lower-energy hydrogen is impossible since one cannot go "south of the south pole."

Second, Applicant takes exception to the PTO's new view that the existence of lower-energy hydrogen, while no longer considered impossible, has not been sufficiently proven. Applicant's Invention is supported by over 50 peer-reviewed publications and over 50 independent validation reports summarized throughout this response.

Applicant fully responded to the Examiner's points in the previous action. In addition, Applicant has further shown that CQM is superior to SQM (standard quantum mechanics). For example, SQM has never solved a physical problem and has never solved conjugate parameters using the wave equation solution from one problem to solve any other. Whereas, the solutions from CQM are shown to be internally consistent and based on physical laws for hundreds of observables, such as over 100 excited states of helium, the solution of over 400 atoms and ions, and the scattering of electrons from helium. These unprecedented CQM achievements compared to the failings of SQM are given in

106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", Progress of Physics, submitted:

Abstract

Quantum mechanics (QM) and quantum electrodynamics (QED) are often touted as the most successful theories ever. In this paper, this claim is critically evaluated by a test of internal consistency for the ability to calculate the conjugate observables of the nature of the free electron, ionization energy, elastic electron scattering, and the excited states of the helium atom using the same solution for each of the separate experimental measurements. It is found that in some cases quantum gives good numbers, but the solutions are meaningless numbers since each has no relationship to providing an accurate physical model. Rather, the goal is to mathematically reproduce an experimental or prior theoretical number using adjustable parameters including arbitrary wave functions in computer algorithms with precision that is often much greater (e.g. 8 significant figures greater) than possible based on the propagation

of errors in the measured fundamental constants implicit in the physical problem. Given the constraints of adherence to physical laws and internal consistency, an extensive literature search indicates that quantum mechanics has never solved a single physical problem correctly including the hydrogen atom and the next member of the periodic chart, the helium atom. Rather than using postulated unverifiable theories that treat atomic particles as if they were not real, physical laws are now applied to the same problem. In an attempt to provide some physical insight into atomic problems and starting with the same essential physics as Bohr of e^- moving in the Coulombic field of the proton and the wave equation as modified after Schrödinger, a classical approach is explored which yields a model which is remarkably accurate and provides insight into physics on the atomic level. The proverbial view deeply seated in the wave-particle duality notion that there is no large-scale physical counterpart to the nature of the electron is shown not to be correct. Physical laws and intuition may be restored when dealing with the wave equation and quantum atomic problems. Specifically, a theory of classical quantum mechanics (CQM) was derived from first principles as reported previously [1-6] that successfully applies physical laws to the solution of atomic problems that has its basis in a breakthrough in the understanding of the stability of the bound electron to radiation. Rather than using the postulated Schrödinger boundary condition: " $\Psi \rightarrow 0$ as $r \rightarrow \infty$ ", which leads to a purely mathematical model of the electron, the constraint is based on experimental observation. Using Maxwell's equations, *the classical wave equation is solved with the constraint that the bound $n = 1$ -state electron cannot radiate energy.* Although it is well known that an accelerated *point* particle radiates, an *extended distribution* modeled as a superposition of accelerating charges does not have to radiate. A simple invariant physical model arises naturally wherein the predicted results are extremely straightforward and internally consistent requiring minimal math as in the case of the most famous equations of Newton, Maxwell, Einstein, de Broglie, and Planck on which the model is based. No new physics is needed; only the known physical laws based on direct observation are used. The accurate solution of the helium atom is confirmed by the agreement of predicted and observed conjugate parameters using the same unique physical model in all cases.

CQM gives extraordinary results that are better than those of QED without the fictitious "virtual particles" that render QED more fiction than science as discussed in:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", Physica Scripta, submitted:

Abstract

The claim that quantum electrodynamics (QED) is the most successful theory in history is critically evaluated. The Dirac equation was postulated in 1926 as a means to remedy the nonrelativistic nature of the Schrödinger equation to provide the missed fourth quantum number. The positive as well as negative square root terms provided an argument for the existence of negative energy states of the vacuum, virtual particles, and corresponding so-called quantum electrodynamics (QED) computer algorithms for calculating unexpected observables such as the Lamb shift and the anomalous magnetic moment of the electron. It is true that it is possible to calculate to a high degree of precision the very small correction to the classical magnetic moment of a point-particle electron using QED, but it is at the expense of any reasonable or verifiable physics. The method relies on a string of far-fetched and unverifiable or disproved assumptions such as (1) infinite electric and magnetic fields that are arbitrarily normalized, (2) a "zoo" of infinite numbers of virtual particles at every point in space, (3) polarization of the vacuum by the proposed virtual particles, (4) postulated participation of the members of the zoo in myriad schemes to cause the so-called polarization, (5) the contribution from each such scheme corresponds to a coefficient based on the product of ratio of the mass of the virtual particle to that of the real particle being experimentally observed and α/π , and (6) the schemes can be arbitrarily truncated to avoid further infinities. Due to the lack of rigor and a physical basis, QED calculations are argued to be meaningless. In a broader sense, the connection between the underlying quantum mechanics and reality is more than just a "philosophical" issue. It reveals that quantum mechanics is not a correct or complete theory of the physical world and that inescapable internal inconsistencies and incongruities arise when attempts are made to treat it as a physical as opposed to a purely mathematical "tool". Some of these issues are discussed in a review by Laloë [1]. Moreover, Dirac's original attempt to solve the bound electron physically with stability with respect to radiation according to Maxwell's equations with the further constraints that it was relativistically invariant and gives rise to electron spin is achievable using a classical approach. Starting with the same essential physics as Bohr, Schrödinger, and Dirac of e^- moving in the Coulombic field of the proton and the wave equation as modified after Schrödinger, advancements in the understanding of the stability of the bound electron to radiation is applied to solve for the exact nature of the electron. Rather than using the postulated Schrödinger boundary condition: " $\Psi \rightarrow 0$ as $r \rightarrow \infty$ ", which leads to a purely mathematical model of the electron, the constraint is based on experimental observation. Using Maxwell's equations, *the classical wave equation is solved with the constraint that the bound $n = 1$ -state electron cannot radiate energy*. Although it is well known that an accelerated point particle radiates, an *extended distribution* modeled as a superposition of accelerating charges does not have to radiate. A simple invariant physical

model arises naturally wherein the predicted results are extremely straightforward and internally consistent requiring minimal math as in the case of the most famous equations of Newton, Maxwell, Einstein, de Broglie, and Planck on which the model is based. No new physics is needed; only the known physical laws based on direct observation are used. Rather than invoking untestable "flights of fantasy", the results of QED such as the anomalous magnetic moment of the electron, the Lamb Shift, the fine structure and hyperfine structure of the hydrogen atom, and the hyperfine structure intervals of positronium and muonium can be solved exactly from Maxwell's equations to the limit possible based on experimental measurements which confirms QED's illegitimacy as representative of reality.

As another example of the triumph of CQM over SQM, Applicant has solved over 400 atoms and ions in exact closed-form equations containing the integer nuclear charge only:

102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", Physics Essays, submitted:

ABSTRACT

It is true that the Schrödinger equation can be solved exactly for the hydrogen atom; although, it is not true that the result is the exact solution of the hydrogen atom. Electron spin is missed entirely, and there are many internal inconsistencies and nonphysical consequences that do not agree with experimental results. The Dirac equation does not reconcile this situation. Many additional shortcomings arise such as instability to radiation, negative kinetic energy states, intractable infinities, virtual particles at every point in space, the Klein paradox, violation of Einstein causality, and "spooky" action at a distance. Despite its successes, quantum mechanics (QM) has remained mysterious to all who have encountered it. Starting with Bohr and progressing into the present, the departure from intuitive, physical reality has widened. The connection between quantum mechanics and reality is more than just a "philosophical" issue. It reveals that quantum mechanics is not a correct or complete theory of the physical world and that inescapable internal inconsistencies and incongruities arise when attempts are made to treat it as a physical as opposed to a purely mathematical "tool". Some of these issues are discussed in a review by Laloë [1]. But, QM has severe limitations even as a tool. Beyond one-electron atoms, multielectron-atom quantum mechanical equations can not be solved except by approximation methods involving adjustable-parameter theories (perturbation theory, variational methods, self-consistent field method,

multi-configuration Hartree Fock method, multi-configuration parametric potential method, $1/Z$ expansion method, multi-configuration Dirac-Fock method, electron correlation terms, QED terms, etc.)—all of which contain assumptions that can not be physically tested and are not consistent with physical laws. In an attempt to provide some physical insight into atomic problems and starting with the same essential physics as Bohr of e^- moving in the Coulombic field of the proton and the wave equation as modified after Schrödinger, a classical approach was explored which yields a model which is remarkably accurate and provides insight into physics on the atomic level [2-4]. Physical laws and intuition are restored when dealing with the wave equation and quantum mechanical problems. Specifically, a theory of classical quantum mechanics (CQM) was derived from first principles that successfully applies physical laws on all scales. Rather than use the postulated Schrödinger boundary condition: " $\Psi \rightarrow 0$ as $r \rightarrow \infty$ ", which leads to a purely mathematical model of the electron, the constraint is based on experimental observation. Using Maxwell's equations, *the classical wave equation is solved with the constraint that the bound $n = 1$ -state electron cannot radiate energy.* The electron must be extended rather than a point. On this basis with the assumption that physical laws including Maxwell's equation apply to bound electrons, the hydrogen atom was solved exactly from first principles. The remarkable agreement across the spectrum of experimental results indicates that this is the correct model of the hydrogen atom. In this paper, the physical approach was applied to multielectron atoms that were solved exactly disproving the deep-seated view that such exact solutions can not exist according to quantum mechanics. The general solutions for one through twenty-electron atoms are given. The predictions are in remarkable agreement with the experimental values known for 400 atoms and ions.

These results can not be matched by SQM. The probability that CQM can calculate 100's of observables in exact equations containing fundamental constants based only on laws of nature and not be the correct theory of nature is essentially zero. In contrast, SQM is easily shown to be fatally flawed, as discussed previously in:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", Physica Scripta, submitted.
106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", Progress of Physics, submitted.

102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", Physics Essays, submitted.
94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", Physics Essays, submitted.
80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Fondation Louis de Broglie, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

In his previous Response, Applicant identified other deficiencies contained in the Souw I Appendix, including Examiner Souw's bias in citing his own papers. The following rationalization given by the Examiner in denying any bias merely raises further questions:

Applicant's allegation against Examiner Souw's technical publications cited in the Appendix as being allegedly "a subject of

Applicant's criticism" is misaddressed, since those papers have nothing to do with Applicant's claim(s). They merely provide support to the Examiner's viewpoint through evidence of sufficient proficiency in Quantum Mechanics. They also expose the inadequacy or factual incapacity of Applicant's GUT/CQM to derive comparable formulation for transition probabilities and line intensities, complete with verifiable selection rules, of which the conventional QM is proven capable, as demonstrated by the Examiner's own experiment and theoretical works cited in the May 7 appendix. A classic example is here the famous work by E.H. Condon and G.H. Shortley, "The Theory of Atomic Spectra", Cambridge 1967, which serves as a standard to most advanced spectroscopists until today. One cannot dismiss an established and evidently successful theory without offering a better alternative. Therefore, Applicant's GUT/CQM remains incredible; or speculative at best.

Once again, such self-serving statements only strengthen Applicant's argument. Examiner Souw's papers most certainly do more than merely support his views by showing a proficiency in Quantum Mechanics. By his own admission, the Examiner believes that his own experimental and theoretical works cited in those papers also expose the supposed inadequacy or factual incapacity of Applicant's CQM. Based on that belief, it is highly unlikely—if not impossible—that Examiner Souw can remain impartial in his consideration of CQM, which if accepted as true, would require him to invalidate his own work.

The proof of this is the minimal consideration of Applicant's scientific evidence given in the Souw I and II Appendices and the length to which the Examiner presents strained arguments to dismiss that evidence on superficial grounds. As discussed above, CQM gives superior results compared to SQM. In CQM, the selection rules and line intensities are based on Maxwell's equation as given in Chp 2 of

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

whereas, in SQM, the mechanism is not physical. It is forced since multipole coupling of point-particle-probability-density functions is physically nonsensical. Applicant has recently derived the Stark effect using CQM. Using the selection rules derived from Maxwell's equations, Applicant has predicted the lines and their energies and polarization for over 100 hydrogen transitions in perfect agreement with observations. In contrast, the internal inconsistencies and ad hoc definitions regarding the parabolic-coordinate quantum numbers of the Stark effect theory of SQM disproves SQM as discussed in Chp 2 of:

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

The following further arguments presented on Appendix page 4 regarding the Examiner's supposed technical expertise does not adequately explain his failure to properly consider the evidence of record:

Since the cited Examiner's papers cannot possibly have been criticized by Applicant, citing his own publication(s) does not make the Examiner's view "*biased*", as alleged by Applicant. In the contrary, such technical papers provide a solid evidence that the Examiner is in possession of sufficient background for evaluating Applicant's claimed invention. In this regard, the Examiner can add a further evidence of strong background in microwave plasmas generated in a resonance cavity similar to those used by Applicant. Not only in Theory, but also hands-on in its design, construction and routine operation, as well as in its spectroscopy, both low and high resolutions [1].

Applicant's insistence that the present application be examined only by those Examiner(s) who have ***no*** pre-knowledge of QM is unpersuasive, since such an Examiner would not be able to give any evaluation –let alone, judgment – on the patentability of credibility of Applicant's invention. In a normal legal process, a jury member's judgment may be biased under a pre-knowledge of the case, but still, he/she must be knowledgeable in the subject matter.

In a patent examination process a pre-knowledge of the relevant subject matter lends the Examiner a better capability to make proper judgment about the credibility or patentability of the claimed invention.

If the Examiner is the expert he claims to be, then surely he knows that it is impossible to achieve the >10 eV Doppler broadening in microwave driven plasmas under the conditions reported by Applicant unless there was a heretofore unknown energetic process.

Further, since SQM fails to predict the existence of lower-energy hydrogen consistent with Maxwell's equations, it is a very salient argument that the Examiner is not trained with the proper background to comprehend the present invention. One learned in physical laws, and specifically Maxwell's equations, is required. Since SQM violates Maxwell's equations, special relativity, causality, and many other physical laws, then it is understandable that the Examiner is unable to follow the physical steps of the invention.

The following additional arguments presented on page 5 of the Souw II Appendix are no more compelling:

Furthermore, the Examiner's refutation presented in the May 7 Appendix is not just theoretical, but also experimental, among others, regarding a He-II line that has been misidentified by Applicant as a hydrino line (Appendix page 3, 1st paragraph), also regarding a contamination peak in Applicant's XPS spectra that has been misidentified by Applicant as being due to a *hydrinoide* compound, (this terminology – meaning a hydrino-based “*hydride*” – is here preferred rather than Applicant's terminology “*novel hydrogen compound*”, for which there is no evidence for its existence, neither experimental nor theoretical).

In response, Applicant notes that it is unclear that the 30.4 nm line is He II. From paper #67, R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542:

It is proposed that the 30.4 nm peak shown in Figures 2-4 was not entirely due to the He II transition. In the case of the helium-hydrogen mixture, the

ratio of 30.4 *nm* (40.8 *eV*) peak to the 25.6 *nm* (48.3 *eV*) peak was 10 compared to 5.4 for helium alone as shown in Figure 2 which implies only a minor He II transition contribution to the 30.4 *nm* peak.

In addition, the excessive peak width did not support the assignment to He II.

The absence of the other primary peaks of any possible impurities with lines in the region of the observed hydrino eliminates the Examiner's assignment, as discussed previously and in Applicant's cited papers. Furthermore, the coating is shown to be a hydride by TOF-SIMS that is orders of magnitude more stable than ordinary hydride. This is a feature of hydrino hydride compounds disclosed and claimed in the present Invention. Applicant has provided extensive data that confirms these results, such as hydrides that are stable in water as shown in paper nos 7, 9, and 38. These novel hydrides are shown to be stable in water independently with the liquid chromatography results of Ricerca in paper no. 10. They have upfield shifted peaks relative to ordinary hydrides, as confirmed independently by University of Massachusetts Amherst, University of Delaware, National Research Counsel of Canada, and Spectral Data Services. (See paper nos. 8, 10, and particularly 19.)

61. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, Vol. 80, No. 1, pp. 1-20.
45. R. L. Mills, J. He, P. Ray, B. Dhandapani, X. Chen, "Synthesis and Characterization of a Highly Stable Amorphous Silicon Hydride as the Product of a Catalytic Helium-Hydrogen Plasma Reaction", Int. J. Hydrogen Energy, Vol. 28, No. 12, (2003), pp. 1401-1424.
38. R. Mills, E. Dayalan, P. Ray, B. Dhandapani, J. He, "Highly Stable Novel Inorganic Hydrides from Aqueous Electrolysis and Plasma Electrolysis", Electrochimica Acta, Vol. 47, No. 24, (2002), pp. 3909-3926.

19. R. Mills, B. Dhandapani, M. Nansteel, J. He, A. Voigt, "Identification of Compounds Containing Novel Hydride Ions by Nuclear Magnetic Resonance Spectroscopy", *Int. J. Hydrogen Energy*, Vol. 26, No. 9, (2001), pp. 965-979.
10. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.
9. R. Mills, "Novel Inorganic Hydride", *Int. J. of Hydrogen Energy*, Vol. 25, (2000), pp. 669-683.
8. R. Mills, B. Dhandapani, M. Nansteel, J. He, T. Shannon, A. Echezuria, "Synthesis and Characterization of Novel Hydride Compounds", *Int. J. of Hydrogen Energy*, Vol. 26, No. 4, (2001), pp. 339-367.
7. R. Mills, "Highly Stable Novel Inorganic Hydrides", *Journal of New Materials for Electrochemical Systems*, Vol. 6, (2003), pp. 45-54.

The corresponding lower-energy hydrogen that is more stable than ordinary hydrogen has been isolated from the decomposition of the hydrides and thoroughly tested. The novel hydrogen has a higher liquefaction temperature, higher ionization energy, and an upfield-shifted NMR spectrum as reported in:

103. R. Mills, B. Dhandapani, W. Good, J. He, "New States of Hydrogen Isolated from K_2CO_3 Electrolysis Gases", *Chemical Engineering Science*, submitted.
98. R. L. Mills, Y. Lu, J. He, M. Nansteel, P. Ray, X. Chen, A. Voigt, B. Dhandapani, "Spectral Identification of New States of Hydrogen", *New Journal of Chemistry*, submitted.

On page 5 of the Souw II Appendix, Applicant notes the following additional arguments which are similarly easily rebutted:

It is noted, none of the experimental refutations presented by the Examiner in the May 7 Appendix has been persuasively and successfully argued by Applicant. This will be addressed in more details in the following Examiner's Response to Applicant's arguments against the Appendix attached to the May 7 Advisory Action.

(b) Regarding Applicant's arguments against the 05/07 Appendix

Applicant's argument on page 24, 1st full paragraph, with regard to impurity peaks in XPS spectra, in which Applicant is questioning *the Examiner's "credibility"* for allegedly proposing "*no alternative assignment*" is unpersuasive. The Examiner has given a *definitive* (not just alternative) assignment to Applicant's hydride peak, i.e., the fact that it disappears after the sample surface has been cleaned, as recited in May 7 Appendix, page 4, lines 9-12.

The "cleaning" referred to above was ion sputtering to remove contamination due to handling the sample, if any. None, however, was noted by comparing the before and after results. From paper #68:

ToF-SIMS Characterization

The commercial silicon wafer, HF cleaned silicon wafer, and α -SiH coated nickel foil samples were characterized using Physical Electronics TRIFT ToF-SIMS instrument. The primary ion source was a pulsed $^{69}\text{Ga}^+$ liquid metal source operated at 15 keV [32-33]. The secondary ions were exacted by a ± 3 keV (according to the mode) voltage. Three electrostatic analyzers (Triple-Focusing-Time-of-Flight) deflect them in order to compensate for the initial energy dispersion of ions of the same mass. The 400 pA dc current was pulsed at a 5 kHz repetition rate with a 7 ns pulse width. The analyzed area was $60\mu\text{m} \times 60\mu\text{m}$ and the mass range was 0-1000 AMU. The total ion dose was $7 \times 10^{11} \text{ ions/cm}^2$, ensuring static conditions. Charge compensation was performed with a pulsed electron gun operated at 20 eV electron energy. In order to remove surface contaminants and expose a fresh surface for analysis, the samples were sputter-cleaned for 30 s using a $80\mu\text{m} \times 80\mu\text{m}$ raster, with 600 pA current, resulting in a total ion dose of $10^{15} \text{ ions/cm}^2$. Three different regions on each sample of $60\mu\text{m} \times$

60 μm were analyzed. The positive and negative SIMS spectra were acquired. Representative post sputtering data is reported. The ToF-SIMS data were treated using 'cadence' software (Physical Electronics), which calculates the mass calibration from well-defined reference peaks.

The hydride was not removed with sputtering, which showed that the sample was in fact hydride. It also confirmed the source of the novel XPS peaks was a hydride film.

XPS and TOF-SIMS can identify all of the known elements in all of the oxidation states known for the particular element. There is no element or oxidation state of an element called "impurity." Since the peaks could not be assigned to any known element in any oxidation state as shown by the survey scan, Figure 12 of paper 61, compared to the XPS data of the known elements and their oxidation states (See Ref. 35 of paper #61: C. D. Wagner, W. M. Riggs, L. E. Davis, J. F. Moulder, G. E. Mulilenberg (Editor), *Handbook of X-ray Photoelectron Spectroscopy*, Perkin-Elmer Corp., Eden Prairie, Minnesota, (1997)), it must be to an element with a new binding energy. The coating is hydride as shown by TOF-SIMS that is orders of magnitude more stable than ordinary hydride as shown by TOF-SIMS and XPS, and the XPS peaks matched those predicted for hydrino hydride. Thus, the assignment is well supported by the data; whereas, an alternative assignment is not.

From paper #61:

The 0-70 eV binding energy region of a nickel foil coated with an $\alpha - \text{SiH}$ film and exposed to air for 20 min. before XPS analysis is shown in Figure 21. By comparison of the $\alpha - \text{SiH}$ sample to the controls, novel XPS peaks were identified at 11, 43, and 55 eV. These peaks do not correspond to any of the primary elements, silicon, carbon, or oxygen, shown in the survey scan in Figure 12, wherein the peaks of these elements are given by Wagner et al. [35]. Hydrogen is the only element which does not have primary element peaks; thus, it is the only candidate to produce the novel peaks and correspond to the H content of the SiH coatings.

These peaks closely matched hydrides formed by the catalytic reaction of He^+ with atomic hydrogen and subsequent reactions to form highly stable silicon hydride products $\alpha - SiH$ that were discussed previously [31].

From paper #45:

The energetic plasma reaction was used to synthesize a potentially commercially important product. Nickel substrates were coated by the reaction product of a low pressure microwave discharge plasma of SiH_4 (2.5%)/ He (96.6%)/ H_2 (0.9%). The ToF-SIMS identified the coatings as hydride by the large SiH^+ peak in the positive spectrum and the dominant H^- in the negative spectrum. XPS identified the H content of the SiH coatings as hydride ions, $H^-(1/4)$, $H^-(1/9)$, and $H^-(1/11)$ corresponding to peaks at 11, 43, and 55 eV, respectively. The novel hydride ions are proposed to form by the catalytic reaction of He^+ with atomic hydrogen and subsequent autocatalytic reactions of $H(1/p)$ to form highly stable silicon hydride products $SiH(1/p)$ (p is an integer greater than one in Eqs. (4-5)). The SiH coating was amorphous as indicated by the shape of the $Si\ 2p$ peak and was remarkably stable to air exposure. After a 48 hour exposure to air, essentially no oxygen was observed as evidence by the negligible $O\ 1s$ peak at 531 eV and absence of any SiO_x $Si\ 2p$ peak in the region of 102-104 eV. The highly stable amorphous silicon hydride coating may advance the production of integrated circuits and microdevices by resisting the oxygen passivation of the surface and possibly altering the dielectric constant and band gap to increase device performance.

Regarding the presence of contaminants, the Examiner is similarly mistaken in concluding on pages 5-6 of the Souw II Appendix that:

Applicant's argument (pg 24, 1st full paragraph, lines 1-5) that a TOF-SIMS pre-analysis conducted on the sample "does not show any impurities" is unpersuasive, since it does not prove that

Applicant's sample is uncontaminated, but merely indicates that Applicant's pre-analysis itself is deficient (Applicant's XPS spectrum, in agreement with ref. (2) of 05/07 Appendix, does show such contamination!).

Again, Applicant notes that the sample was sputtered to remove contamination due to handling, if any. The remaining identified elements were part of the sample. All remaining elements also identified in the XPS could not be assigned to the XPS peaks assigned to hydrino. The sample was hydride by TOF-SIMS following sputtering. The assignment of the sample as essentially all SiH was also consistent with the XPS data. The SiH is novel based on its stability and novel XPS peaks in the low-binding-energy region with no other primary peaks. This XPS feature is unique to hydrogen. The XPS further matched the predicted binding energies for hydrino hydride. Thus, the assignment is correct.

On page 5 of the Souw II Appendix, the Examiner further argues incorrectly that:

It is well-known in the art that TOF-SIMS is more adapted to mass-profiling, owing to its high mass resolution capability, whereas XPS is more suitable for surface contamination analysis, due to its high surface sensitivity [2]. A typical TOF-SIMS surface sensitivity or resolution is 0.15 μm , i.e., 50 times worse than XPS (typically 0.003 μm [2]/pg. 1). Apparently, Applicant's sample was contaminated due to inadequate precautions during its preparation, as advised in ref. [3]/pg. 2 (base pressure must be below $2 \cdot 10^{-10}$ mbar).

The Examiner is obviously confused. Regarding sampling depth, he has it backwards. XPS has a greater sampling depth than TOF-SIMS. He also has it backwards regarding detection limits or sensitivity, TOFSIMS has a detection limit of about 100 times that of XPS. Applicant believes what the Examiner has misread is that XPS has a lower spatial resolution than TOF-SIMS implied by the 0.15 microns for XPS versus 0.003 microns for TOF-SIMS. The Examiner is

referred to the Physical Electronics website for current specifications at <http://www.phi.com/genf.asp?ID=332>.

Furthermore, controls showed no contamination defined as elements that have peaks in the region of those assigned to hydrino. Any possible surface impurities due to handling of the sample and not part of the sample would have been removed with ion sputtering. The XPS and TOF-SIMS were in agreement as to the composition of the sample. The combined results supported the assignment of a novel hydride that matched the predicted hydrino hydride.

From paper #68:

ToF-SIMS Characterization

The commercial silicon wafer, *HF* cleaned silicon wafer, and α -*SiH* coated nickel foil samples were characterized using Physical Electronics TRIFT ToF-SIMS instrument. The primary ion source was a pulsed $^{69}\text{Ga}^+$ liquid metal source operated at 15 keV [32-33]. The secondary ions were exacted by a ± 3 keV (according to the mode) voltage. Three electrostatic analyzers (Triple-Focusing-Time-of-Flight) deflect them in order to compensate for the initial energy dispersion of ions of the same mass. The 400 pA dc current was pulsed at a 5 kHz repetition rate with a 7 ns pulse width. The analyzed area was $60\mu\text{m} \times 60\mu\text{m}$ and the mass range was 0-1000 AMU. The total ion dose was $7 \times 10^{11} \text{ ions}/\text{cm}^2$, ensuring static conditions. Charge compensation was performed with a pulsed electron gun operated at 20 eV electron energy. In order to remove surface contaminants and expose a fresh surface for analysis, the samples were sputter-cleaned for 30 s using a $80\mu\text{m} \times 80\mu\text{m}$ raster, with 600 pA current, resulting in a total ion dose of $10^{15} \text{ ions}/\text{cm}^2$. Three different regions on each sample of $60\mu\text{m} \times 60\mu\text{m}$ were analyzed. The positive and negative SIMS spectra were acquired. Representative post sputtering data is reported. The ToF-SIMS data were treated using 'cadence' software (Physical Electronics), which calculates the mass calibration from well-defined reference peaks.

The pressure was adequately maintained in the TOF-SIMS and XPS. Neither analysis showed impurities that could give rise to the peaks assigned to

hydrino. None of the controls showed any unexpected elements. The XPS spectrum was independently obtained at the Zettlemoyer Center for Surface Studies, Sinclair Laboratory, Lehigh University, Bethlehem, PA.

Amazingly, the Examiner accuses Applicant of being confused, but succeeds only in further demonstrating his own confusion:

Applicant's confusion with its own XPS results has been further enhanced by the well-known variability of the XPS peak position with regard to valence/oxidation state of the atom and its chemical environment [4]/pg. 1, as well as due to surface charging [3]/pg. 4, altogether finally led Applicant's peak misidentification.

No primary element peaks were observed for any potential oxidation state of possible impurities (which have to be known, assignable elements) in this region. Thus, they were eliminated. Nickel foils were used to avoid charging. Charging was also eliminated and the peak positions confirmed as follows:

XPS Characterization

A series of XPS analyses were made on the samples using a Scienta 300 XPS Spectrometer. The fixed analyzer transmission mode and the sweep acquisition mode were used. The angle was 15° . The step energy in the survey scan was 0.5 eV , and the step energy in the high resolution scan was 0.15 eV . In the survey scan, the time per step was 0.4 seconds, and the number of sweeps was 4. In the high resolution scan, the time per step was 0.3 seconds, and the number of sweeps was 30. $C\ 1s$ at 284.5 eV was used as the internal standard.

The valance band edge of the $\alpha - SiH$ film formed by the $SiH_4 - He - H_2$ plasma reaction was determined relative to that of crystalline silicon using XPS of the valance region in order to estimate the band gap. This required careful minimization of the charging effect that causes a spectral shift. The charging effect was nullified by two procedures: (1) charge neutralization was applied during XPS data acquisition, and (2) the spectra of the $\alpha - SiH$ film and the crystalline silicon sample were further calibrated by the $Si\ 2p_{3/2}$ core level that

was set at a binding energy of 99.8 eV. See 100. R. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride from a Helium Plasma Reaction", Materials Chemistry and Physics, submitted, as well as papers

61. R. L. Mills, B. Dhandapani, J. He, "Highly Stable Amorphous Silicon Hydride", Solar Energy Materials & Solar Cells, Vol. 80, No. 1, pp. 1-20.

45. R. L. Mills, J. He, P. Ray, B. Dhandapani, X. Chen, "Synthesis and Characterization of a Highly Stable Amorphous Silicon Hydride as the Product of a Catalytic Helium-Hydrogen Plasma Reaction", Int. J. Hydrogen Energy, Vol. 28, No. 12, (2003), pp. 1401-1424.

Similar procedures were implemented in the analyses reported in the other Applicant's papers reporting hydrino.

The Examiner's limited, but erroneous, analysis of Applicant's experimental data is further revealed by the arguments appearing on Appendix pages 6-7:

Applicant's argument on page 24, 1st full paragraph, lines 6-9, is unpersuasive because it has no substance, seemingly an attempt to defend and justify Applicant's obvious misidentification of the 304? He-II line that has been already pointed out in the May 7 Appendix, page 3, 1st paragraph. Applicant's "new evidence" in the form of recent (2003) publications on EUV spectra from a microwave discharge of He/H mixture does not change that fact that Applicant has factually misidentified the 304Å line as being due to a hydrino translation.

The 30.4 nm line was not misidentified, and it was considered in the context of the other lines in the spectrum. Specifically, extreme ultraviolet (EUV) spectroscopy was recorded on microwave discharges of helium with 2% hydrogen. Novel emission lines were observed with energies of $q \cdot 13.6 \text{ eV}$, $q = 1, 2, 3, 7, 9, 11$. or $q \cdot 13.6 \text{ eV}$, $q = 4, 6, 8$ less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $\text{He}(1s^2)$ to $\text{He}(1s^1 2p^1)$. These strong emissions are not found in any single gas plasma, and cannot be assigned to the known emission of any species of the single

gases studied such as H , H^- , H_2 , H_2^+ , H_3^+ , He , He_2^* , and He^+ , known species of the mixture such as He_2^+ , HeH^+ , HeH , HH_2^+ , and HHe_n^+ and He_n , or possible contaminants [Ref. 67]. However, the results can be explained by a novel catalytic reaction involving atomic hydrogen to form hydrinos. All of the lines $q \cdot 13.6 \text{ eV}$ lines matched hydrino, and there were no other lines in the short wavelength region. Thus, this assignment is very likely, and there is no alternative provided by the Examiner. These results have been considered by peers in multiple publications:

67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542.
33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.
29. R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 533-564.
28. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, (2002), Vol. 27, No. 3, pp. 301-322.

which support Applicant's position over that of the Examiner.

Furthermore, it is not clear that the 30.4 nm line is He II. From #67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542:

It is proposed that the 30.4 nm peak shown in Figures 2-4 was not entirely due to the He II transition. In the case of the helium-hydrogen mixture, the ratio of 30.4 nm (40.8 eV) peak to the 25.6 nm (48.3 eV) peak was 10

compared to 5.4 for helium alone as shown in Figure 2 which implies only a minor He II transition contribution to the 30.4 nm peak.

In addition, the excessive peak width did not support the assignment to He II.

The Examiner further mistakenly argues on page 7 of the Appendix:

Regarding Applicant's claim of other EUV lines in a 2003 paper (RCE ref. (50)), the Examiner does not see any compelling reason why they must be due to hydrino transitions, since there are many other possible origins that are conventional, as also addressed in the main part of this Office Action. In this regard, Applicant's explanation as to how a catalytic reaction (?) with, or resonance (?) transfer to helium ions (ionization energy 54.4 eV) could possibly induce a nonradiative transition of atomic hydrogen to $n=1/2$ ($\text{\AA} < 54.4 \text{ eV}$!), and then followed by radiative transition further to $n=1/3$ or lower, is not persuasive (starting with which n ? Hopefully not $n=\infty$, since that "resonance" is not a transition, but electron capture!).

In short, to attribute those new lines to hydrino origin is speculation, Applicant is here trying to speculatively interpret a vague experimental observation to justify his own hypothesis of hydrino.

As discussed in multiple peer-reviewed articles, the EUV lines match hydrino and can not be assigned to impurities:

67. R. L. Mills, P. Ray, "Extreme Ultraviolet Spectroscopy of Helium-Hydrogen Plasma", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542.
33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.
29. R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 533-564.

28. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, (2002), Vol. 27, No. 3, pp. 301-322.

The energy for the transition $H(1/7) \rightarrow H(1/8) + (8^2 - 7^2)X13.6eV$ is 204 eV. Electron capture energies are typically millions of electron volts.

The energies of the hydrino transitions are internally consistent with the measured energy balance and hot hydrogen recorded on the same plasmas:

37. R. L. Mills, P. Ray, B. Dhandapani, R. M. Mayo, J. He, "Comparison of Excessive Balmer α Line Broadening of Glow Discharge and Microwave Hydrogen Plasmas with Certain Catalysts", J. of Applied Physics, Vol. 92, No. 12, (2002), pp. 7008-7022.
49. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355.
63. R. L. Mills, X. Chen, P. Ray, J. He, B. Dhandapani, "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry", Thermochemica Acta, Vol. 406/1-2, (2003), pp. 35-53.
77. J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", Journal of Applied Physics, Vol. 96, No. 6, pp. 3095-3102.

The corresponding lower-energy molecular hydrogen has been isolated from the same helium-hydrogen microwave plasmas:

From #98. R. L. Mills, Y. Lu, J. He, M. Nansteel, P. Ray, X. Chen, A. Voigt, B. Dhandapani, "Spectral Identification of New States of Hydrogen", New Journal of Chemistry, submitted:

ABSTRACT

Novel emission lines with energies of $q \cdot 13.6 \text{ eV}$ where $q = 1, 2, 3, 4, 6, 7, 8, 9, 11$ were previously observed by extreme ultraviolet (EUV) spectroscopy recorded on microwave discharges of helium with 2% hydrogen [R. L. Mills, P. Ray, J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1535-1542]. These lines matched $H(1/p)$, fractional Rydberg states of atomic hydrogen wherein $n = \frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \dots, \frac{1}{p}$; ($p \leq 137$ is an integer) replaces the well known parameter $n = \text{integer}$ in the Rydberg equation for hydrogen excited states. Evidence supports that these states are formed by a resonant nonradiative energy transfer to He^+ acting as a catalyst. Ar^+ also serves as a catalyst to form $H(1/p)$; whereas, krypton, xenon, and their ions serve as controls. $H(1/p)$ may react with a proton and two $H(1/p)$ may react to form $H_2(1/p)^+$ and $H_2(1/p)$, respectively, that have vibrational and rotational energies that are p^2 times those of the species comprising uncatalyzed atomic hydrogen. A series of over twenty peaks in the 10-65 nm region emitted from low-pressure helium-hydrogen (90/10%) and argon-hydrogen (90/10%) microwave plasmas matched the energy spacing of 2^2 times the transition-state vibrational energy of H_2^+ with the series ending on the bond energy of $H_2(1/4)^+$. Rotational lines were observed in the 145-300 nm region from atmospheric pressure electron-beam excited argon-hydrogen plasmas. The unprecedented energy spacing of 4^2 times that of hydrogen established the internuclear distance as $1/4$ that of H_2 and identified $H_2(1/4)$. $H_2(1/p)$ gas was isolated by liquefaction at liquid nitrogen temperature and by decomposition of compounds found to contain the corresponding hydride ions $H^-(1/p)$. The $H_2(1/p)$ gas was dissolved in $CDCl_3$ and characterized by 1H NMR. Considering solvent effects, singlet peaks upfield of H_2 were observed with a predicted integer spacing of 0.64 ppm at 3.47, 3.02, 2.18, 1.25, 0.85, and 0.22 ppm which matched the consecutive series $H_2(1/2)$, $H_2(1/3)$, $H_2(1/4)$, $H_2(1/5)$, $H_2(1/6)$, and $H_2(1/7)$, respectively. Excess power was absolutely measured from the helium-hydrogen plasma. For an input of 41.9 W, the total plasma power of the helium-hydrogen plasma measured by water bath calorimetry was 62.1 W corresponding to 20.2 W of excess power in 3 cm^3 plasma volume. The excess power density and energy balance were high, 6.7 W/cm^3 and $-5.4 \times 10^4 \text{ kJ/mole } H_2$ (280 eV/H atom), respectively. In addition to power applications, battery and propellant reactions are proposed that may be transformational, and observed excited vibration-rotational levels of $H_2(1/4)$ could be the basis of a UV laser that could significantly advance photolithography.

The Examiner is also mistaken in his beliefs expressed on page 7 of the
 Souw II Appendix:

Regarding the Balmer á line broadening recited on page 24, last paragraph, and page 25, 1st – 6th paragraphs, Applicant's arguments are unpersuasive, because:

(i) the Black Light Process Theory is not a valid argument or support, for being based on a flawed theory not accepted by the scientific world, i.e., the GUT/CQM, also for lack of experimental evidence. Furthermore, to prove something using the same thing that is to be proven, is a classic *Circular Reasoning*.

(ii) Regarding the alleged hydrino origin of Applicant's hydrogen line broadening, it is too well-known that hydrogen transitions are easily perturbed by the plasma and microwave fields, since the atomic hydrogen has only one electron that is not protected by screening effects, especially those having large l quantum numbers. Especially in microwave plasmas, anomalous broadening of hydrogen lines (also helium lines) has been subjected to experimental and theoretical studies for decades [5].

Regarding the arguments in (i) above, the theory used as a basis to predict the lower-energy states of hydrogen was accepted for at least a generation before quantum mechanics. That theory is Maxwell's equations and the physical laws. The approach of applying these laws to the atom was strongly argued by the founders of quantum mechanics, and the predictions from CQM are better than those of quantum mechanics as discussed in:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", Physica Scripta, submitted.

106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", Progress of Physics, submitted.

102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", Physics Essays, submitted.

94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", Physics Essays, submitted.

80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Fondation Louis de Broglie, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", Physics Essays, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

That the results validate the theoretical predictions shows predictability and internal consistency, not circular reasoning. In contrast, there are no predictions in the case of quantum mechanics, including the prediction of the spectral lines of atomic hydrogen. Rather, quantum mechanics is based only on circular reasoning between a postulated operator and wave equation combination, set up to give the Rydberg series of lines, rather than a first principles unique prediction as discussed in the cited papers.

Regarding the arguments in (ii) above, the broadening reported in the Examiner's reference [5] URL:
<http://www.phys.tue.nl/FLTPD/Luggenhoelscher.pdf> is 0.37 cm⁻¹ with no field and 3.7 cm⁻¹ with the application of the microwave field. The energies

corresponding to these widths are $4.5 \times 10^{-5} \text{ eV}$ and $4.5 \times 10^{-4} \text{ eV}$, respectively, which is absolutely negligible compared to the $>10 \text{ eV}$ hot H found in rt-plasmas. The microwave field can not explain Applicant's results of extraordinary broadening observed in these cells with catalysts present and not observed under identical conditions with no catalyst present.

On pages 8-9 of the Souw II Appendix, the Examiner pushes the following erroneous arguments:

In this regard, Applicant's repeated referrals to his own measurements of such anomalous broadening as an "overwhelming evidence" for the existence of hydrino, is not persuasive in at least two aspects.

Firstly, Applicant's reports reciting catalytic reaction involving hydrino as the origin for the line broadening observed, are mostly non-refereed publications, as already identified in the previous Office Actions. This also applies to the new references presented in the RCE (see main Office Action). Those published in peer-reviewed journals do not mention "hydrino", or "hydrogen states with fractional energy levels", or anything the like, and therefore, they cannot be considered as "support". In a very few cases, ambiguous term(s) are used by Applicant, so they can neither be considered support for Applicant's hydrino, since what a person of ordinary skill in the art understands under, e.g., "*novel catalytic reaction involving atomic hydrogen*", or "*new kind of plasma*" may be anything else but not related to Applicant's "hydrino" as hypothesized in the GUT/CQM. For example, Applicant's most recent reference [6] (RCE ref (49)) does not recite the word "hydrino", or "*hydrogen of fractional energy level*", or the like, nor does it refer to GUT/CQM at all. Consequently, the phenomenon described in such papers must be considered as being completely unrelated to Applicant's invention.

Secondly, and most importantly, anomalous hydrogen line broadening is not at all an evidence for the existence of hydrino, because it is well known in the art that such a broadening may be caused by many other conventional mechanisms, such as microwave plasma effects, the latter having not been considered by Applicant. Instead, such an effect has been so far ignored or dismissed by Applicant without any valid reason. The measured excessive line-width, shown in Applicant's Fig. 6 of ref. [6], i.e., 0.27 nm, is about the same magnitude as what is measured by other

authors, e.g., ref. [5] cited in the May 7 Appendix, here reproduced in Fig. 1 below.

Again, these arguments are misplaced. The broadening has been independently replicated and is published in top peer-reviewed journals. The only explanation that fits the data is the catalytic reaction of the present Invention as shown in the paper nos. 16, 20, 30, 33-37, 39, 42-43, 49, 51-52, 54-55, 57, 63-65, 68-69, 71-74, 81-85, 88-89, 91, 92, 93, 95-97, and 105. See also previous sections of this Response above.

Furthermore, it is clear in paper #49 that hydrino and the catalytic reaction to form hydrino are described as indicated by the text that gives the catalytic reaction of atomic hydrogen, as well as the energy levels of hydrino:

A new low-electric field plasma source has been developed that is based on a resonant energy transfer of an integer of 27.2 eV from atomic hydrogen to a catalyst capable of accepting the energy. It operates by incandescently heating a hydrogen dissociator and a catalyst to provide atomic hydrogen and gaseous catalyst, respectively, such that the catalyst reacts with the atomic hydrogen to produce a plasma called a resonant transfer (rt)-plasma. It was extraordinary, that intense vacuum ultraviolet (VUV) emission was observed [14-16] at low temperatures (e.g. $\approx 10^3\text{ K}$) from atomic hydrogen and certain atomized elements or certain gaseous ions which singly or multiply ionize at integer multiples of the potential energy of atomic hydrogen, 27.2 eV that comprise catalysts. The only pure elements that were observed to emit VUV were those wherein the ionization of t electrons from an atom to a continuum energy level is such that the sum of the ionization energies of the t electrons is approximately $m \cdot 27.2\text{ eV}$ where t and m are each an integer. For example, K , Cs , Sr , Sr^+ , and Rb^+ each ionize at integer multiples of the potential energy of atomic hydrogen and caused emission as predicted; whereas, the chemically similar atoms, Na , Mg , and Ba , do not ionize at integer multiples of the potential energy of atomic hydrogen and caused no emission as predicted as well. The theory and balanced resonant energy transfer reactions have been given previously [14-15, 17] or are in press [16, 18].

In addition, Ar^+ and He^+ each ionize at an integer multiple of the potential energy of atomic hydrogen; thus, a discharge with one or more of Sr^+ , Ar^+ , and He^+ present with hydrogen was anticipated to form an rt-plasma. Mills and Nansteel [14] have reported that rt-plasmas formed with Sr^+ and Ar^+ catalysts at 1% of the theoretical or prior known voltage requirement with a light output per unit power input of up to 8600 times that of control standard light sources. Characteristic emission was observed from a continuum state of Ar^{2+} which confirmed the resonant nonradiative energy transfer of 27.2 eV from atomic hydrogen Ar^+ [19]. Predicted emission lines were observed from helium-hydrogen [17-18, 20] as well as strontium-argon-hydrogen plasmas [19] that supported the rt-plasma mechanism.

He^+ ionizes at 54.417 eV which is $2 \cdot 27.2\text{ eV}$, and novel VUV emission lines were observed from microwave and glow discharges of helium with 2% hydrogen [20]. The observed energies were $q \cdot 13.6\text{ eV}$ ($q = 1, 2, 3, 4, 6, 7, 8, 9, \text{ or } 11$) or these discrete energies less 21.2 eV corresponding to inelastic scattering of these photons by helium atoms due to excitation of $He(1s^2)$ to $He(1s^1 2p^1)$. These lines can be explained by the resonant transfer of 2 times 27.2 eV , with He^+ to He^{2+} [20].

It is also clear that hydrino is discussed according to references 18, 10, and 27 of paper #49:

18. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

20. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.

27. R. L. Mills, P. Ray, J. Dong, M. Nansteel, B. Dhandapani, J. He, "Spectral Emission of Fractional-Principal-Quantum-Energy-Level Atomic and Molecular Hydrogen", Vibrational Spectroscopy, Vol. 31, No. 2, (2003), pp. 195-213.

that correspond to the following paper nos. filed in this case:

28. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, (2002), Vol. 27, No. 3, pp. 301-322.

33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

50. R. L. Mills, P. Ray, J. Dong, M. Nansteel, B. Dhandapani, J. He, "Spectral Emission of Fractional-Principal-Quantum-Energy-Level Atomic and Molecular Hydrogen", Vibrational Spectroscopy, Vol. 31, No. 2, (2003), pp. 195-213.

Other mechanisms, including microwave plasma effects, have definitely been considered and eliminated, as discussed previously. As discussed above, the Examiner is grossly in error regarding the relative difference between the results in paper #49 and those of the Examiner's reference 5. The broadening reported in the Examiner's reference URL:

<http://www.phys.tue.nl/FLTPD/Luggenhoelscher.pdf> is 0.37 cm⁻¹ with no field and 3.7 cm⁻¹ with the application of the microwave field. The energies corresponding to these widths are 4.5×10^{-5} eV and 4.5×10^{-4} eV, respectively, which is absolutely negligible compared to the >10 eV hot H found in rt-plasmas. The microwave field can not explain Applicant's results.

Further, regarding Fig. [1] (from ref.[5]) reproduced on page 10 of the Souw II Appendix, the Examiner seriously errs in arguing on page 9 that:

As shown in Fig. [1], the anomalous line width of 0.16 nm, measured in a microwave discharge similar to Applicant's under the same gas mixture and pressure range, is about 10 times the Doppler width, and has been attributed to microwave plasma effects. Applicant's previous criticism on this reference [5] is unjustified. The paper was a conference publication posted by a research group from the University of Essen, Germany. It is not a lone-standing unrefereed paper as alleged by Applicant, but instead, supported by a large number of experimental and theoretical works, as listed at the end of the paper. It would have been extremely doubtful to one of ordinary skill in the art if any cause other than the RF/microwave field itself should be held responsible for an effect that is only and exclusively observed on RF/microwave plasmas.

The PTO should be more careful in reading the units of Fig. [1], which are in cm⁻¹, **NOT nm**. The difference is about **SIX ORDERS MAGNITUDE in H energy**. This mistake is systematic of the Committee's casual treatment of the evidentiary record in this case.

Also, the extraordinary selective H broadening is also observed on rt-cells where there is no RF/microwave field as reported in the following papers:

81. R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", European Physical Journal-Applied Physics, in press.
55. R. Mills, P. Ray, R. M. Mayo, "Chemically-Generated Stationary Inverted Lyman Population for a CW HI Laser", European J of Phys. D, submitted.
57. R. L. Mills, P. Ray, "Spectroscopic Characterization of Stationary Inverted Lyman Populations and Free-Free and Bound-Free Emission of Lower-Energy State Hydride Ion Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Group I Catalysts", Journal of Quantitative Spectroscopy and Radiative Transfer, No. 39, sciencedirect.com, April 17, (2003).

54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.
51. R. Mills, P. Ray, R. M. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.
46. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population and a Very Stable Novel Hydride Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Catalysts", Optical Materials, in press.
42. R. L. Mills, P. Ray, "A Comprehensive Study of Spectra of the Bound-Free Hyperfine Levels of Novel Hydride Ion $H^-(1/2)$, Hydrogen, Nitrogen, and Air", Int. J. Hydrogen Energy, Vol. 28, No. 8, (2003), pp. 825-871.

The Examiner then draws the following erroneous conclusions on page 11 of the Appendix:

Thus, Applicant's "excessive line broadening" is not at all an evidence for Applicant's hypothetical "hydrino", but rather, a conventional effect that has been already observed by other authors, as evidenced in Fig. 1. Such a high frequency Stark effect has never been considered in any of Applicant's numerous reports on "anomalous" or "excessive" line broadening. Instead, Applicant always assumes that Doppler effect were the main cause, as clearly stated on pp. 6-7 of Applicant's Appendix attached to the RCE. The assumption of Doppler effect as a main mechanism for Applicant's line broadening has been known as incorrect for RF and microwave plasmas, as discussed above. Applicant's misassumption of this line-broadening mechanism automatically disqualifies all Applicant's arguments based on anomalous or excessive line broadening in microwave plasmas.

The broadening is unequivocally Doppler broadening as discussed fully above. The microwave-field broadening cited in Examiner's Ref. [5] is six orders

of magnitude too low to account for the broadening reported by Applicant in the paper cited in the Examiner's Ref. [6]. In fact, the point of the paper (Examiner's Ref. [5]) was the very technically difficult Doppler-free two-photon excitation to show the microwave effect which can not otherwise be observed since it is overwhelmed by the Doppler broadening.

The Stark effect was considered and eliminated. Specifically, from #49. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Inductively and Capacitively Coupled RF, Microwave, and Glow Discharge Hydrogen Plasmas with Certain Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. (2003), pp. 338-355:

Stark broadening of hydrogen lines in plasmas can not be measured at low electron densities using conventional emission or absorption spectroscopy because it is hidden by Doppler broadening. In the case of the Lyman α line, the Stark width exceeds the Doppler width only at $n_e > 10^{17} \text{ cm}^{-3}$ for temperatures of about 10^4 K [34]. Gigos and Cardenoso [35] give the observed Balmer α Stark broadening for plasmas of hydrogen with helium or argon as a function of the electron temperature and density. For example, the Stark broadening of the Balmer α line recorded on a $H + He^+$ plasma is only 0.033 nm with $T_e = 20,000 \text{ K}$ and $n_e = 1.4 \times 10^{14} \text{ cm}^{-3}$.

The relationship between the Stark broadening $\Delta\lambda_s$ of the Balmer β line in nm , the electron density n_e in m^{-3} , and the electron temperature T_e in K is

$$\log n_e = C_0 + C_1 \log(\Delta\lambda_s) + C_2 [\log(\Delta\lambda_s)]^2 + C_3 \log(T_e) \quad (5)$$

where $C_0 = 22.578$, $C_1 = 1.478$, $C_2 = -0.144$, and $C_3 = 0.1265$ [36]. From Eq. (5), to get a Stark broadening of only 0.1 nm with $T_e = 9000 \text{ K}$, an electron density of about $n_e \sim 3 \times 10^{15} \text{ cm}^{-3}$ is required, compared to that of the argon-hydrogen plasma of $< 10^9 \text{ cm}^{-3}$ determined using a compensated Langmuir probe, over six orders of magnitude less. Regional maxima in electron densities that could give rise to Stark broadening was eliminated as a possibility. The measured electron densities did not exceed 10^9 cm^{-3} , and the axial variation was weak, showing less than a factor of two change throughout the brightest region of the plasma. The high mass

diffusivity of all of the species present made it unlikely that a large density gradient existed anywhere in the plasma at steady state. This result was also evident by the good fit to a Gaussian profile recorded on the argon-hydrogen plasma rather than a Voigt profile as shown in Figure 10. In addition, the line broadening for Balmer β , γ , and δ was comparable to that of Balmer α ; whereas, an absence of broadening beyond the instrument width was observed for the lines of argon or helium species such as the 667.73 nm and 591.2 nm Ar I lines and 667.816 nm and 587.56 nm He I lines. Thus, the Stark broadening was also insignificant.

A linear Stark effect arises from an applied electric field that splits the energy level with principal quantum number n into $(2n - 1)$ equidistant sublevels. The magnitude of this effect given by Videnovic et al. [8] is about $2 \times 10^{-2} \text{ nm} / \text{kV} \cdot \text{cm}^{-1}$. No appreciable applied electric field was present in our study; thus, the linear Stark effect should be negligible. The absence of broadening of the noble gas lines and the hydrogen lines of the controls confirmed the absence of a strong electric field. No charged resonator cavity surfaces were present since the plasmas was contained in a quartz tube with the cavity external to the tube. A microwave E-mode field does exist in the Evenson cavity that is a function of the reflected power [37-38], and the catalysis reaction is dependent on this field as discussed previously [39]. However, there is no cathode fall region and the magnitude of the microwave field is comparably much less than that found in the cathode fall region of a glow discharge cell.

Additional analytical mistakes can be found on page 11 of the Appendix, wherein the Examiner argues:

Applicant's statement on page 6, that "The Examiner does not present any alternative explanation for the cited data", is doubly unpersuasive. Firstly, alternative explanation was readily provided by the result shown in Fig. 1, which has been explicitly cited in the previous May 7 Appendix [5].

Secondly, there is no obligation for the Examiner to provide "alternative explanation" as demanded by Applicant, since a patent examination is neither a scientific debate nor a scientific research, such that Applicant's demand is improper. Similar to the case of the misidentified XPS contamination line, for the purpose of patent

examination only the factual evidence is relevant, i.e., that the broadening is not due to Applicant's hypothetical hydrino. Any attempt to rely on such hypothesis (notwithstanding the theoretical flaws), where there is already another theory that is scientifically sound and experimentally verified, is essentially unjustified, and hence, must be deemed incredible, or speculative at best. After all, it is Applicant's invention that is deemed incredible under §101, so the burden is on Applicant's side to prove his credibility.

Once again, the Examiner is grossly in error, this time regarding the relative difference between the results in paper #49 and those of the Examiner's reference 5. The broadening reported in the Examiner's reference URL <http://www.phys.tue.nl/FLTPD/Luggenhoelscher.pdf> is 0.37 cm⁻¹ with no field and 3.7 cm⁻¹ with the application of the microwave field. The energies corresponding to these widths are $4.5 \times 10^{-5} \text{ eV}$ and $4.5 \times 10^{-4} \text{ eV}$, respectively, which is absolutely negligible compared to the >10 eV hot H found in rt-plasmas. The microwave field can not explain Applicant's results.

Further, Applicant has shown by the broadening and analysis of chemical compounds discussed previously in this Response that the energy and hydrino product is observed. The Examiner has not shown to the contrary. Thus, unable to refute Applicant's scientific evidence on scientific grounds, the Examiner resorts to mere hand waving without any basis in the data.

Applicant has also shown that atomic problems can be solved using physical laws, rather than fantastical mathematical constructs of SQM, and the results are superior as discussed previously in this Response.

On Appendix page 12, the Examiner continues his limited, but faulty analysis, of Applicant's novel hydrogen technology:

Inversion of line intensities, either of the Balmer series of other series, is well known in laser and plasma physics since many decades. As already recited in the previous Office Action, one of ordinary skill in the art should better look for other conventional mechanisms as a cause for inversion of line intensities and enhanced EUV emission, instead of making a premature claim of a hypothetical hydrino. Furthermore, the references named by Applicant do not specifically recite the unambiguous word "hydrino", or "hydrogen states with fractional energy levels", or anything the

like, so they cannot be considered as support for Applicant's hydrino Hypothesis.

As discussed in these papers, no plasma model provides a mechanism for inversion. A pumping power source is required. The Examiner provides no alternative explanation.

Papers that report inversion and pumping clearly discuss the hydrino reaction and hydrino product:

81. R. Mills, P. Ray, B. Dhandapani, W. Good, P. Jansson, M. Nansteel, J. He, A. Voigt, "Spectroscopic and NMR Identification of Novel Hydride Ions in Fractional Quantum Energy States Formed by an Exothermic Reaction of Atomic Hydrogen with Certain Catalysts", European Physical Journal-Applied Physics, in press.
59. R. Mills, P. Ray, R. M. Mayo, "The Potential for a Hydrogen Water-Plasma Laser", Applied Physics Letters, Vol. 82, No. 11, (2003), pp. 1679-1681.
55. R. Mills, P. Ray, R. M. Mayo, "Chemically-Generated Stationary Inverted Lyman Population for a CW HI Laser", European J of Phys. D, submitted.
57. R. L. Mills, P. Ray, "Spectroscopic Characterization of Stationary Inverted Lyman Populations and Free-Free and Bound-Free Emission of Lower-Energy State Hydride Ion Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Group I Catalysts", Journal of Quantitative Spectroscopy and Radiative Transfer, No. 39, sciencedirect.com, April 17, (2003).
54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509.
51. R. Mills, P. Ray, R. M. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247.

46. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population and a Very Stable Novel Hydride Formed by a Catalytic Reaction of Atomic Hydrogen and Certain Catalysts", Optical Materials, in press.
42. R. L. Mills, P. Ray, "A Comprehensive Study of Spectra of the Bound-Free Hyperfine Levels of Novel Hydride Ion $H^-(1/2)$, Hydrogen, Nitrogen, and Air", Int. J. Hydrogen Energy, Vol. 28, No. 8, (2003), pp. 825-871.

From #54. R. L. Mills, P. Ray, "Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Catalysts", J. Phys. D, Applied Physics, Vol. 36, (2003), pp. 1504-1509:

ABSTRACT

A new chemically generated plasma source is reported. The presence of gaseous Rb^+ or K^+ ions with thermally dissociated hydrogen formed a low applied temperature, extremely low voltage plasma called a resonant transfer or rt-plasma having strong vacuum ultraviolet (VUV) emission. We propose an energetic catalytic reaction involving a resonant energy transfer between hydrogen atoms and Rb^+ or $2K^+$ since Rb^+ to Rb^{2+} , $2K^+$ to $K + K^{2+}$, and K to K^{3+} each provide a reaction with a net enthalpy equal to the potential energy of atomic hydrogen. Remarkably, a stationary inverted Lyman population was observed; thus, these catalytic reactions may pump a cw HI laser as predicted by a collisional radiative model used to determined that the observed overpopulation was above threshold.

The hydrino lines are clearly referenced:

(12) Mills, R; Ray, P.; Dhandapani, B.; Nansteel, M.; Chen, X.; He, J J. *Mol. Struct.* **2002** 643 (1-3), 43-54.

(14) Mills, R.; Ray, P. *Int. J. Hydrogen Energy* **2002**, 27, 301–322.

which correspond to papers:

28. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, (2002), Vol. 27, No. 3, pp. 301-322.
33. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", J Mol. Struct., Vol. 643, No. 1-3, (2002), pp. 43-54.

From #51 (R. Mills, P. Ray, R. M. Mayo, "CW HI Laser Based on a Stationary Inverted Lyman Population Formed from Incandescently Heated Hydrogen Gas with Certain Group I Catalysts", IEEE Transactions on Plasma Science, Vol. 31, No. 2, (2003), pp. 236-247):

Prior related studies that support the possibility of a novel reaction of atomic hydrogen which produces a chemically generated or assisted plasma (rt-plasma) and produces novel hydride compounds include VUV spectroscopy [7-8, 13-14, 19-21, 29, 35-42], characteristic emission from catalysts and the hydride ion products [19-21, 39-40], lower-energy hydrogen emission [13, 36-38, 41], chemically formed plasmas [7-8, 19-21, 35, 39-40], Balmer α line broadening [8, 14, 20, 29, 36-37, 41-42], elevated electron temperature [14, 29, 36, 41], H population inversion [42], anomalous plasma afterglow duration [19, 35], power generation [29, 36-37, 41], and analysis of novel chemical compounds [43-44].

The theory and hydrino reaction and related predicted observations are referenced in this paper:

7. R. Mills, J. Dong, Y. Lu, "Observation of Extreme Ultraviolet Hydrogen Emission from Incandescently Heated Hydrogen Gas with Certain Catalysts", Int. J. Hydrogen Energy, Vol. 25, (2000), pp. 919-943.
8. R. Mills and M. Nansteel, P. Ray, "Argon-Hydrogen-Strontium Discharge Light Source", IEEE Transactions on Plasma Science, Vol. 30, No. 2, (2002), pp. 639-653.

9. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; posted at www.blacklightpower.com.
10. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 565-590.
11. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", Int. J. Hydrogen Energy, Vol. 26, No. 10, (2001), pp. 1059-1096.
13. R. Mills, P. Ray, "Spectral Emission of Fractional Quantum Energy Levels of Atomic Hydrogen from a Helium-Hydrogen Plasma and the Implications for Dark Matter", Int. J. Hydrogen Energy, Vol. 27, No. 3, pp. 301-322.
14. R. L. Mills, P. Ray, B. Dhandapani, J. He, "Comparison of Excessive Balmer α Line Broadening of Glow Discharge and Microwave Hydrogen Plasmas with Certain Catalysts", J. Appl. Phys., submitted.
19. H. Conrads, R. Mills, Th. Wrubel, "Emission in the Deep Vacuum Ultraviolet from an Incandescently Driven Plasma in a Potassium Carbonate Cell", Plasma Sources Science and Technology, submitted.
20. R. L. Mills, P. Ray, "A Comprehensive Study of Spectra of the Bound-Free Hyperfine Levels of Novel Hydride Ion $H^-(1/2)$, Hydrogen, Nitrogen, and Air", Int. J. Hydrogen Energy, in press.
21. R. Mills, P. Ray, "Spectroscopic Identification of a Novel Catalytic Reaction of Potassium and Atomic Hydrogen and the Hydride Ion Product", Int. J. Hydrogen Energy, Vol. 27, No. 2, (2002), pp. 183-192.
29. R. L. Mills, P. Ray, "Substantial Changes in the Characteristics of a Microwave Plasma Due to Combining Argon and Hydrogen", New Journal of Physics, www.njp.org, Vol. 4, (2002), pp. 22.1-22.17.

35. R. Mills, T. Onuma, and Y. Lu, "Formation of a Hydrogen Plasma from an Incandescently Heated Hydrogen-Catalyst Gas Mixture with an Anomalous Afterglow Duration", *Int. J. Hydrogen Energy*, Vol. 26, No. 7, July, (2001), pp. 749-762.
36. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "Spectroscopic Identification of Transitions of Fractional Rydberg States of Atomic Hydrogen", *J. of Quantitative Spectroscopy and Radiative Transfer*, Vol. 76, No. 1, (2003), pp. 117-130.
37. R. L. Mills, P. Ray, B. Dhandapani, M. Nansteel, X. Chen, J. He, "New Power Source from Fractional Quantum Energy Levels of Atomic Hydrogen that Surpasses Internal Combustion", *J Mol. Struct.*, Vol. 643, No. 1-3, (2002), pp. 43-54.
38. R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", *Int. J. Hydrogen Energy*, Vol. 27, No. 5, (2002), pp. 533-564.
39. R. Mills, "Spectroscopic Identification of a Novel Catalytic Reaction of Atomic Hydrogen and the Hydride Ion Product", *Int. J. Hydrogen Energy*, Vol. 26, No. 10, (2001), pp. 1041-1058.
40. R. L. Mills, P. Ray, "Spectroscopic Identification of a Novel Catalytic Reaction of Rubidium Ion with Atomic Hydrogen and the Hydride Ion Product", *Int. J. Hydrogen Energy*, Vol. 27, No. 9, (2002), pp. 927-935.
41. R. L. Mills, X. Chen, P. Ray, J. He, B. Dhandapani, "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry", *Thermochimica Acta*, in press.
42. R. Mills, P. Ray, R. M. Mayo, "The Potential for an Extremely Versatile Hydrogen Water-Plasma Laser", *Phys. Rev. E*, submitted.

43. R. Mills, B. Dhandapani, M. Nansteel, J. He, T. Shannon, A. Echezuria, "Synthesis and Characterization of Novel Hydride Compounds", Int. J. of Hydrogen Energy, Vol. 26, No. 4, (2001), pp. 339-367.
44. R. Mills, B. Dhandapani, N. Greenig, J. He, "Synthesis and Characterization of Potassium Iodo Hydride", Int. J. of Hydrogen Energy, Vol. 25, Issue 12, December, (2000), pp. 1185-1203.

The Examiner presents further questionable arguments on Appendix page 12:

Novel VUV vibration spectra, too, may be caused by conventional effects, such as molecular gas dynamics, i.e., an exchange of translational and vibrational energies, which is the principle of gas dynamic lasers, and has nothing to do with hydrinos.

This makes no sense. No known molecule or molecular ion has vibration energies of 1.18 eV. Thus, the Examiner's alternative explanation of the data, such as that given in paper no. 29, R. Mills, P. Ray, "Vibrational Spectral Emission of Fractional-Principal-Quantum-Energy-Level Hydrogen Molecular Ion", Int. J. Hydrogen Energy, Vol. 27, No. 5, (2002), pp. 533-564, is incorrect.

The Examiner presents another questionable argument on Appendix page 12, demonstrating a fundamental lack of understanding of experimental techniques:

Water bath calorimetry is an outdated method that has proven unreliable for demonstrating the efficiency of energy generation, as evidenced by the infamous failure of the cold fusion experiment, which also relied on such calorimetry, but could not be reproduced by anyone else.

The Examiner is confusing the validity of cold fusion experiments to show heat by water bath calorimetry with the validity of the technique itself. Water bath calorimetry is the "gold standard."

The power balance due to the present Invention has been confirmed by water bath, heat loss, and Calvet calorimetry as given in paper nos. 30-31, 33, 35-36, 39, 43, 50, 63, 71-73, 76-77, 81, 84, 89, 92, 93, 98, 101, 104. The measurement of large power densities and energy balances by water bath

calorimetry as reported in #63 (R. L. Mills, X. Chen, P. Ray, J. He, B. Dhandapani, "Plasma Power Source Based on a Catalytic Reaction of Atomic Hydrogen Measured by Water Bath Calorimetry", *Thermochimica Acta*, Vol. 406/1-2, (2003), pp. 35-53) has recently been confirmed independently and published in a top tier journal.

From the abstract of paper 77 (J. Phillips, R. L. Mills, X. Chen, "Water Bath Calorimetric Study of Excess Heat in 'Resonance Transfer' Plasmas", *Journal of Applied Physics*, Vol. 96, No. 6, pp. 3095-3102):

Water bath calorimetry was used to demonstrate one more peculiar phenomenon associated with a certain class of mixed gas plasmas termed resonant transfer, or RT plasmas. Specifically, He/H₂ (10%) (500 mTorr), Ar/H₂ (10%) (500 mTorr), and H₂O(g) (500 and 200 mTorr) plasmas generated with an Evenson microwave cavity consistently yielded on the order of 50% more heat than non RT plasma (controls) such as He, Kr, Kr/H₂ (10%), under identical conditions of gas flow, pressure, and microwave operating conditions. The excess power density of RT plasmas was of the order $10 \text{ W} \cdot \text{cm}^{-3}$. In earlier studies with these same RT plasmas it was demonstrated that other unusual features were present including dramatic broadening of the hydrogen Balmer series lines, unique vacuum ultraviolet (VUV) lines, and in the case of water plasmas, population inversion of the hydrogen excited states. Both the current results and the earlier results are completely consistent with the existence of a hitherto unknown exothermic chemical reaction, such as that predicted by Mills, occurring in RT plasmas.

The Examiner further argues on Appendix page 13 that:

Applicant's misinterpretation of the examiner's statement of a *stationary state* as being of a static electron, i.e., an unmoving electron (Applicant's Response, pg. 27, 2nd paragraph, lines 1-2 and 5-6) is a grave misrepresentation. No person skilled in the art would ever misunderstand such a simple, conventional terminology like "*stationary state*".

By that argument then, the Examiner has to admit that a point electron that moves about the nucleus in any manner must radiate since it must, at some point in the trajectory, undergo acceleration as shown by textbooks such as J. D. Jackson, "Radiation by Moving Charges", *Classical Electrodynamics*, Second Edition, John Wiley & Sons, New York, (1975), Chp. 14.

From paper #107. (R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", *Physica Scripta*, submitted:

Both the Schrödinger and Dirac equations have many problems which make them untenable as representing reality as discussed *supra*.— infinities, lack of Einstein causality (spooky action at a distance), self interaction, *instability to radiation*, negative kinetic energy states, Klein paradox, and more [1-10]. This was argued by the founders of quantum mechanics [22, 30-31].

1. F. Laloë, Do we really understand quantum mechanics? Strange correlations, paradoxes, and theorems, *Am. J. Phys.* 69 (6), June 2001, 655-701.

2. R. L. Mills, "The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics", submitted; posted at <http://www.blacklightpower.com/pdf/Feynman%27s%20Argument%20Spec%20UPDATE%20091003.pdf>.

3. R. L. Mills, "Classical Quantum Mechanics", submitted; posted at <http://www.blacklightpower.com/pdf/CQMTheoryPaperTablesand%20Figures080403.pdf>.

4. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", submitted; posted at <http://www.blacklightpower.com/pdf/technical/Exact%20Classical%20Quantum%20Mechanical%20Solutions%20for%20One-Through%20Twenty-Electron%20Atoms%20042204.pdf>.

5. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", submitted; posted at <http://www.blacklightpower.com/pdf/technical/H2PaperTableFiguresCaptions111303.pdf>.

6. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", submitted; posted at <http://www.blacklightpower.com/pdf/technical/ExactCQMSolutionforAtomicHelium073004.pdf>.

7. R. L. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, January 2004 Edition posted at <http://www.blacklightpower.com/bookdownload.shtml>.

8. R. L. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", *Int. J. Hydrogen Energy*, Vol. 27, No. 5, (2002), pp. 565-590.

9. R. L. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", *Int. J. Hydrogen Energy*, Vol. 26, No. 10, (2001), pp. 1059-1096.

10. R. L. Mills, "The Hydrogen Atom Revisited", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.

22. A. Einstein, B. Podolsky, N. Rosen, *Phys. Rev.*, Vol. 47, (1935), p. 777.

30. L. de Broglie, "On the true ideas underlying wave mechanics", *Old and New Questions in Physics, Cosmology, Philosophy, and Theoretical Biology*, A. van der Merwe, Editor, Plenum Press, New York, (1983), pp. 83-86.

31. D. C. Cassidy, *Uncertainty the Life and Science of Werner Heisenberg*, W. H. Freeman and Company, New York, (1992), pp. 224-225.

As an example of a specific independent analysis by a leading physicist, from Weisskopf (V. F. Weisskopf, *Reviews of Modern Physics*, Vol. 21, No. 2, (1949), pp. 305-315), "Dirac's quantum electrodynamics gave a more consistent derivation of the results of the correspondence principle, but it also brought about a number of new and serious difficulties." Quantum electrodynamics: 1.) **Does not explain nonradiation of bound electrons**; 2.) contains an internal inconsistency with special relativity regarding the classical electron radius—the electron mass corresponding to its electric energy is infinite (The Schrödinger equation fails to predict the classical electron radius); 3.) it admits solutions of negative rest mass and negative kinetic energy; 4.) the interaction of the electron with the predicted zero-point field fluctuations leads to infinite kinetic energy and infinite electron mass; 5.) Dirac used the unacceptable states of negative mass for the description of the vacuum; yet, infinities still arise. Dirac's equation which was postulated to explain spin relies on the unfounded notions of negative energy states of the vacuum, virtual particles, and gamma factors.

Applicant has applied the result that for special cases of an extended distribution (not a point), it is possible to have acceleration without radiation to solve the stability of the hydrogen atom and predict stable lower-energy states as disclosed in the present Invention. See

1. H. A. Haus, "On the radiation from point charges", *American Journal of Physics*, 54, (1986), pp. 1126-1129.
2. Abbott, T. A., Griffiths, D. J., *Am. J. Phys.*, Vol. 53, No. 12, (1985), pp. 1203-1211.
3. P. Pearle, *Foundations of Physics*, "Absence of radiationless motions of relativistically rigid classical electron", Vol. 7, Nos. 11/12, (1977), pp. 931-945.

4. G. Goedecke, Phys. Rev 135B, (1964), p. 281.

5. J. Daboul and J. H. D. Jensen, Z. Physik, Vol. 265, (1973), pp. 455-478.

The solution of the bound electron with the constraint of nonradiation according to Maxwell's equation with the further constraint that the corresponding current is relativistically invariant and reproduces all of the results of the Stern-Gerlach experiment is given in the papers cited above in this Response:

On page 13 of the Appendix, the Examiner misapprehends, yet again, basic quantum principles:

Given two distributions of positional probabilities, $|\psi_1|^2$ and $|\psi_2|^2$, it is quite obvious to one of ordinary skill in the art that the trajectory of an electron in an upper state ψ_2 may easily, and smoothly, "slip" or transit into the trajectory of a lower state ψ_1 , and that the probability for such a transition is proportional to the amount of a spatial overlapping of the two (complex) probability distributions, $\psi_1^* \psi_2$. Given the further fact that – due to energy conservation- the transition is a direct result of, and hence, must be simultaneously accompanied by electromagnetic radiation, a quantitative formulation for the transition probability must involve an electric dipole component of the overlapping, i.e., $\int \psi_1^* \psi_2 d^3r$. This formulation is solidly supported by the fact that no transition dipole is zero, although the two distributions do overlap.

This argument makes no physical sense at all. The electron according to SQM is a point particle with no structure; thus, there is nothing to overlap. The energy difference between states does not have to be released as quantized radiation of the energy difference of states 1 and 2. Rather it could be released continuously as the point electron accelerates into the nucleus. The fact that it doesn't reveals a fatal flaw that was noted by Feynman with his flawed attempt to reconcile the instability of the hydrogen atom as discussed in:

80. R. L. Mills, The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics, Fondation Louis de Broglie, submitted.

A theory of the hydrogen atom can not be correct if it requires that the electron be in the nucleus. Thus, QM is fatally flawed as discussed in Ref. [17, 80]. A valid theory can not permit the electron to "spiral into the nucleus". However, an inescapable fact of QM is that the wave function solution of the SE requires that **the electron be in the nucleus** [17, 80]. In fact, the electron must exist in the nucleus since the wave function is a maximum there. This is clearly claimed in the literature as discussed by Karplus to explain the spin-nuclear coupling called Fermi contact interaction for example [M. Karplus and R. N. Porter, *Atoms and Molecules an Introduction for Students of Physical Chemistry*, The Benjamin/Cummings Publishing Company, Menlo Park, California, (1970), p. 567]. In fact, the probability density function Ψ^2 has a maximum at the nucleus for the $n=1$ state, and the nucleus has a finite volume. Griffiths gives the time average that the electron is in the nucleus [D. J. Griffiths, *Introduction to Quantum Mechanics*, Prentice-Hall, (1995), Prob. 4.14]. This situation corresponds to infinite energy using Feynman's correct assertion [80] that the Coulomb potential must apply to the interaction of the electron and the nucleus.

The flaws in SQM can be traced to the fact that it was never made to satisfy Maxwell's equations. This is obvious since there is no description of the photon in an excited state as there is in the case of CQM as shown in Chp 2 of

1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

Even Dirac originally attempted to solve the bound electron physically with stability with respect to radiation according to Maxwell's equations with the further constraints that it was relativistically invariant and gave rise to electron spin [P. Pearle, *Foundations of Physics*, "Absence of radiationless motions of relativistically rigid classical electron", Vol. 7, Nos. 11/12, (1977), pp. 931-945].

He was unsuccessful and resorted to the current mathematical-probability-wave model that has many problems as pointed out in the following references:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", *Physica Scripta*, submitted.
106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", *Progress of Physics*, submitted.
102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", *Physics Essays*, submitted.
94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", *Physics Essays*, submitted.
80. R. L. Mills, "The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics", *Fondation Louis de Broglie*, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", *Physics Essays*, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", *Int. J. Hydrogen Energy*, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", *Int. J. Hydrogen Energy*, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey,

Distributed by Amazon.com; January 2004 Edition posted at
www.blacklightpower.com.

According to the Examiner, as argued on pages 13-14 of the Appendix:

The correctness of conventional QM is ultimately proven by the fact that highly complex quantum theoretical calculations of transition probabilities and line intensities has been experimentally verified to great accuracies, as demonstrated in the May 7 Appendix. This is to be compared with the factual incapacity of GUT/QCM for doing the same, as discussed previously.

Thus, in contradiction to Applicant's allegation, it has been demonstrated that the rationale behind the atomic transition, including its quantitative formulation, is completely logical and can be understood by one of ordinary skill in the art, as world-widely confirmed by all scholars in quantum physics.

CQM does calculate atomic transitions correctly as discussed previously. It is physical theory versus a postulated mathematical theory, and it gives superior results as discussed previously. Any scholar of quantum mechanics can appreciate that SQM can not reproduce the internally consistent, closed-form, exact results for hundreds of observables that are calculated using CQM given in the references discussed above in this Response.

The Examiner further wrongly criticizes Applicant's use of the Haus formula, arguing on Appendix page 14:

Applicant's use of the Haus's formula is based on a misunderstanding of the electromagnetic theory, i.e. (a) confusing electromagnetic wave fields with charge density by putting the charge density \tilde{n} in place of electric field E in the Helmholtz equation containing the Laplace operator (GUT/QCM pg. 48/Eq.1.1 and Applicant's Response to the May 7 Appendix, pg. 35/Eq. 2).

The current density is obtained as a solution of the wave equation since such solutions conserve energy and angular momentum. The constraint is that the current density must not radiate. A function with each point traveling at the same angular velocity on a spherical shell is a solution of the wave equation. This function modulated by time and spherical harmonic functions are also

solutions. These currents are used to apply the Haus condition. Solutions are found which are nonradiative. This can also be shown using the Poynting Power Theorem. Since the constant function is also electrostatic and magnetostatic, it is trivially nonradiative.

Furthermore, the Schrodinger and Dirac equations postulate point particles, and the accelerating charge must give rise to radiation according to Maxwell's equations and special relativity as shown in Jackson [J. D. Jackson, Classical Electrodynamics, Second Edition, John Wiley & Sons, New York, (1975), p. 659]. Thus, Maxwell's equations and **special relativity are violated**, since both require that these atomic models are not stable to radiation. In contrast, Applicant solves for the charge and current-density functions of the electron rather than probability-wave functions. And, the electron is an extended particle, not a point particle as is the case in QM (the QM point particle has many problems including the prediction of infinite fields which are nonphysical and have never been observed).

From Appendix I of R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics* where the embedded references correspond to those of Appendix I:

THE POYNTING POWER VECTOR

A point charge undergoing periodic motion accelerates and as a consequence radiates according to the Larmor formula:

$$P = \frac{1}{4\pi\epsilon_0} \frac{2e^2}{3c^3} a^2 \quad (1)$$

where e is the charge, a is its acceleration, ϵ_0 is the permittivity of free space, and c is the speed of light. Although an accelerated *point* particle radiates, an *extended distribution* modeled as a superposition of accelerating charges does not have to radiate [1, 11, 15, 41-42]. An ensemble of charges, all oscillating at the same frequency, create a radiation pattern with a number of nodes. The same applies to current patterns in phased array antenna design [43]. It is possible to have an infinite number of charges oscillating in

such as way as to cause destructive interference or nodes in all directions. The electromagnetic far field is determined from the current distribution in order to obtain the condition, if it exists, that the electron current distribution given by Eq. (6) must satisfy such that the electron does not radiate.

The charge-density functions of the electron orbitsphere in spherical coordinates plus time are given by Eqs. (1.64-1.65). For $\ell = 0$, $N = \frac{-e}{8\pi r_n^2}$, and the charge-density function is

$$\rho(r, \theta, \phi, t) = \frac{e}{8\pi r_n^2} [\delta(r - r_n)] [Y_0^0(\theta, \phi) + Y_t^m(\theta, \phi)] \quad (2)$$

The equipotential, uniform or constant charge-density function (Eq. (1.64) and Eq. (2)) further comprises a current pattern given in the ORBITSPHERE EQUATION OF MOTION FOR $\ell = 0$ section. It also corresponds to the nonradiative $n = 1$, $\ell = 0$ state of atomic hydrogen and to the spin function of the electron. The current-density function is given by multiplying Eq. (2) by the constant angular velocity ω_n . There is acceleration without radiation. In this case, centripetal acceleration. A static charge distribution exists even though each point on the surface is accelerating along a great circle. Haus' condition predicts no radiation for the entire ensemble. The same result is trivially predicted from consideration of the fields and the radiated power. Since the current is not time dependent, the fields are given by

$$\nabla \times \mathbf{H} = \mathbf{J} \quad (3)$$

and

$$\nabla \times \mathbf{E} = 0 \quad (4)$$

which are the electrostatic and magnetostatic cases, respectively, with no radiation.

A summary of the stability derivation for p, d, f, etc.. orbitals based on the Haus condition given in Chp. 1 of R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics* is

Nonradiation Based on the Spacetime Fourier Transform of the Electron Current

Although an accelerated *point* particle radiates, an *extended distribution* modeled as a superposition of accelerating charges does not have to radiate. The spacetime Fourier transform of the current-density function is

$$K(s, \Theta, \Phi, \omega) = 4\pi\omega_n \frac{\sin(2sr_n)}{2sr_n} \otimes 2\pi \sum_{\nu=1}^{\infty} \frac{(-1)^{\nu-1} (\pi \sin \Theta)^{2(\nu-1)}}{(\nu-1)!(\nu-1)!} \frac{\Gamma\left(\frac{1}{2}\right) \Gamma\left(\nu + \frac{1}{2}\right)}{(\pi \cos \Theta)^{2\nu+1} 2^{\nu+1}} \frac{2\nu!}{(\nu-1)!} s^{-2\nu}$$

$$\otimes 2\pi \sum_{\nu=1}^{\infty} \frac{(-1)^{\nu-1} (\pi \sin \Phi)^{2(\nu-1)}}{(\nu-1)!(\nu-1)!} \frac{\Gamma\left(\frac{1}{2}\right) \Gamma\left(\nu + \frac{1}{2}\right)}{(\pi \cos \Phi)^{2\nu+1} 2^{\nu+1}} \frac{2\nu!}{(\nu-1)!} s^{-2\nu} \frac{1}{4\pi} [\delta(\omega - \omega_n) + \delta(\omega + \omega_n)]$$

$$\mathbf{s}_n \bullet \mathbf{v}_n = \mathbf{s}_n \bullet \mathbf{c} = \omega_n$$

The relativistically corrected wavelength is

$$\lambda_n = r_n$$

Spacetime harmonics of $\frac{\omega_n}{c} = k$ or $\frac{\omega_n}{c} \sqrt{\frac{\epsilon}{\epsilon_0}}$ for which the Fourier transform of the current-density function is nonzero do not exist. Radiation due to charge motion does not occur in any medium when this condition is met.

Haus, H. A., "On the radiation from point charges", American Journal of Physics, 54, (1986), pp. 1126-1129.

Abbott, T. A., Griffiths, D. J., Am. J. Phys., Vol. 153, No. 12, (1985), pp. 1203-1211.

G. Goedecke, Phys. Rev 135B, (1964), p. 281.

A summary of the stability derivation based on the Poynting Power Vector given in Chp. 1, Appendix I of R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics* is:

Nonradiation Based on the Electron Electromagnetic Fields and the Poynting Power Vector

Although an accelerated *point* particle radiates, an *extended distribution* modeled as a superposition of accelerating charges does not have to radiate. The general multipole field solution to Maxwell's equations in a source-free region of empty space with the assumption of a time dependence $e^{i\omega_n t}$ is

$$\begin{aligned} \mathbf{B} &= \sum_{\ell, m} \left[a_E(\ell, m) f_\ell(kr) \mathbf{X}_{\ell, m} - \frac{i}{k} a_M(\ell, m) \nabla \times g_\ell(kr) \mathbf{X}_{\ell, m} \right] \\ \mathbf{E} &= \sum_{\ell, m} \left[\frac{i}{k} a_E(\ell, m) \nabla \times f_\ell(kr) \mathbf{X}_{\ell, m} + a_M(\ell, m) g_\ell(kr) \mathbf{X}_{\ell, m} \right] \end{aligned} \quad (1)$$

For the electron source current comprising a multipole of order (ℓ, m) , the far fields are given by

$$\begin{aligned} \mathbf{B} &= -\frac{i}{k} a_M(\ell, m) \nabla \times g_\ell(kr) \mathbf{X}_{\ell, m} \\ \mathbf{E} &= a_M(\ell, m) g_\ell(kr) \mathbf{X}_{\ell, m} \end{aligned} \quad (2)$$

and the time-averaged power radiated per solid angle $\frac{dP(\ell, m)}{d\Omega}$ is

$$\frac{dP(\ell, m)}{d\Omega} = \frac{c}{8\pi k^2} |a_M(\ell, m)|^2 |\mathbf{X}_{\ell, m}|^2 \quad (3)$$

where $a_M(\ell, m)$ is

$$a_M(\ell, m) = \frac{-ek^2}{c\sqrt{\ell(\ell+1)}} \frac{\omega_n}{2\pi} Nj_\ell(kr_n) \Theta \sin(mks) \quad (4)$$

In the case that k is the lightlike k^0 , then $k = \omega_n / c$, in Eq. (4), and Eqs. (2-3) vanishes for

$$s = vT_n = R = r_n = \lambda_n \quad (5)$$

There is no radiation.

The relativistic correction to the electron radius is derived in the Special Relativistic Correction to the Ionization Energies section of Chp. 1 of R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*. A summary of the relativistic correction to the electron radius is:

Special Relativistic Correction to the Electron Radius

The relationship between the electron wavelength and its radius is given by

$$2\pi r = \lambda$$

where λ is the de Broglie wavelength.

The distance along each great circle in the direction of instantaneous motion undergoes length contraction and time dilation. Using a phase matching condition, the wavelengths of the electron and laboratory inertial frames are equated, and the corrected radius is given by

$$r_n = r'_n \left[\sqrt{1 - \left(\frac{v}{c}\right)^2} \sin \left[\frac{\pi}{2} \left(1 - \left(\frac{v}{c}\right)^2 \right)^{3/2} \right] + \frac{1}{2\pi} \cos \left[\frac{\pi}{2} \left(1 - \left(\frac{v}{c}\right)^2 \right)^{3/2} \right] \right]$$

where the electron velocity is given by

$$v_n = \frac{\hbar}{m_e r_n}$$

$\frac{e}{m_e}$ of the electron, the electron angular momentum of \hbar , and μ_B are invariant, but the mass and charge densities increase in the laboratory frame due to the relativistically contracted electron radius. As $v \rightarrow c$, $r/r' \rightarrow \frac{1}{2\pi}$ and $r = \lambda$.

The Examiner continues his unfounded criticism of Applicant's use of the Haus formula by arguing on Appendix page 14:

Applicant's use of the Haus's formula is based on a misunderstanding of the electromagnetic theory, i.e. . . . (b) confusing current density j in Haus's Eq. 6. In an attempt to justify his position, not only Applicant has failed to correct the relevant mistakes, but he further introduced new inconsistencies in regards of the fundamental concept of physics, i.e., by equating the current density j with the product of charge density \tilde{n} and angular velocity $\dot{\varphi}$, under the wrong assumption that "*in the case of harmonic motion the current density function is given by the time derivative of the charge density function*", such that "*the current density function is*

given by the product of the constant angular velocity \dot{u} and the charge density function \tilde{n} " (pg. 40/lines 2-7 from bottom), i.e., Applicant meant $j = dp/dt = \tilde{n} q \frac{d(\exp-i\dot{u}t)}{dt} = \tilde{n} \dot{u}$. However, a quick and simple dimensional analysis shows there is a unit of length missing in Applicant's formulation. The correct formula is $j = e \tilde{n} v = e \tilde{n} \dot{u} r$, which results in $[C] [m^{-3}] [sec^{-1}] [m] = C/m^2/sec$, bearing the proper unit of current density. Note further that neither \dot{u} nor e is constant, since the constant of motion is here the angular momentum $\sim \dot{u} r^2$. Thus, Applicant's formulation of the Haus's condition remains incorrect as stated in the 05/07 Appendix.

The Examiner has erred once again. In Applicant's solution of the electron, the charge is confined to a two dimensional shell; thus, it is in units of C/m^2 (See Eqs. (1.64-1.65)). Since the charge moves time harmonically on the surface, the magnitude of the current density is given by the constant frequency times the charge density to give the units of $C/m^2/sec$ "bearing the proper unit of current density" according to the Examiner. Thus, the Fourier transform of the current density function is correctly given by Eq. (1.40), and the current density is nonradiative according to the condition of Eq. (1.45).

The same result is obtained using the Poynting Power Vector in Appendix I of Ref. 1. The Examiner is not correct that Applicant's solution for the electron is not stable to radiation. Since it is magnetostatic and electrostatic, in addition to the nonradiation result from Haus, it is trivially nonradiative.

The following arguments found on page 15 of the Appendix are also easily refuted:

As a last test, to evaluate one more of Applicant's responses to the Examiner's 05/07 Appendix, i.e., on Applicant's misunderstanding of the Special Relativity Theory by incorrectly applying the Lorentz contraction formula on an orbiting electron, where it is well known in the art that Special Theory is only valid for linearly moving systems without acceleration. In an attempt to justify his initial violation of physics law, Applicant sets even forth with violating another fundamental principle of special relativity by postulating a (radial) velocity equal to c (pg. 41/lines 1-2 after Eq. 1.44).

Applicant correctly uses the Lorentz contraction for an inertial frame. In particular, the electron frame is an inertial frame. Special relativistic effects are certainly observed for particles that are traveling in curved paths as well as in linear paths. Time dilation of the decay of muons in a synchrotron is one example. eB/m bunching of electrons in a gyrotron [P. Sprangle and A. T. Drobot, "The linear and self-consistent nonlinear theory of the electron cyclotron maser instability", IEEE Transactions on Microwave Theory and Techniques, Vol. MTT-25, No. 6, June, (1977), pp. 528-544] occurs because the cyclotron frequency is inversely proportional to the relativistic electron mass. This further demonstrates that the electron frame is an inertial frame and that mass and time dilation occur. Since the special relativistic relationship in polar coordinates is not found in textbooks, Applicant derived it, and did so correctly as given in Eq. (1.249).

The Examiner, continuing on page 15 of the Appendix, argues: "Firstly, a velocity equal to c would make the electron mass infinite." Again, the Examiner is making false assumptions.

The electron velocity is not equal to the speed of light. It is given by Eq. (1.56) of Ref. 1. For hydrogen the atom in the $n=1$ state, the speed is 2.10×10^6 m/sec as given in Table 1.2 of Ref. 1. When radiation is considered, the motion of the electron is determined with respect to the light-like frame k_0 . This is NOT equivalent to the electron speed at c .

The Examiner shows confusion again in further arguing on Appendix page 15:

Secondly, if the radial projection or component of the velocity is equal to c , then the magnitude of the electron's velocity must be even larger than c , which then means Applicant's electron is a "tachyon" that does not belong to our real world.

The light-like frame relative to the electron's motion is considered. The electron's velocity in its frame is given by Eq. (1.56) of Ref. 1. The Examiner reading this response is probably sitting stationary or moving slowly with the lights on. As an analogy, the frame of interest is the frame traveling with respect

to the Examiner at the speed of light since an emitted photon must travel at c , as are the photons emitted by the light that the Examiner is using to read this document.

The Examiner continues on page 15:

(c) Thirdly, Applicant is violating the QM by postulating an electron wave number k that is equal to \dot{u}/c , i.e., having no dispersion (pg. 31/lines 2-4 after Eq. 1.65 and pg. 42/1st full paragraph, lines 2-3). Applicant's proof of Haus's non-radiative condition by substituting Eq. 1.45 into Eq. 1.40 with $k=s=\dot{u}_n/c$ and $r_n=\ddot{e}$, which results in $\text{sinc}(2sr_n) \cdot \text{sinc}(2.2_)=0$, is only possible under the (wrong) assumption of a dispersionless wave $k=\dot{u}_n/c$, which is only valid for photons, but invalid for electron and material waves in general. Being a material wave, the electron *must have a dispersion*, with a group velocity V related to the frequency \dot{u} according to the dispersion formula $V=d\dot{u}/dk$, where k is the wave number, defined as $k=2_/\ddot{e}$, and \ddot{e} is the *de Broglie* wavelength, related to the particle momentum p as $\ddot{e}=h/p$ with h -Planck's constant, thus resulting in $p=hk/2_ = \hbar k$. We thus have the energy-momentum relation $E = p^2/2m + U = \hbar^2 k^2/2m + U$, where U is the potential energy. In QM, the particle's energy is related to the particle-wave velocity \dot{u} as $E=\hbar\dot{u}$. This results in a dispersion relation for material waves, $\dot{u} = \dot{u}(k) = (\hbar^2 k^2/2m + U)/\hbar$, , which also means that material waves is always dispersive, $k = [v(2m(\hbar\dot{u}-U))]/\hbar$. In other words, k can never be a constant in terms of \dot{u} as postulated by Applicant in lines 2-3 of the 1st full paragraph on page 42, i.e., $K=\dot{u}_n/c$ only valid for mass-less photons, but nor for electrons. Even is Applicant's assumption of $r_n=\ddot{e}_n$ were accepted (in fact it is wrong, because of said violation of special theory of relativity), substituting $s=k=[v(2m(\hbar\dot{u}-U))]/\hbar$ into Applicant's Eq. 1.40, we obtain a condition $K(s,\dot{u}) \sim \text{sin}(2s?r_n) - \text{sin}(2\ddot{e}_n v[(2m(\hbar\dot{u}-U))/\hbar])$ which does not identically vanish as Applicant (wrongly) postulated on pg. 42/1st full paragraph, lines 1-2 (consequently, also in GUT/CQM). Consequently, relying on Applicant's own words, the hydrino state should be radiative, too.

The Examiner gives the dispersion relationship for a matter wave according to the Schrodinger equation and SQM as shown in D. A. McQuarrie, Quantum Chemistry, University Science Books, Mill Valley, CA, (1983), pp. 78-

79. The Examiner further proves from this dispersion relationship that SQM does not provide stability to radiation. A finite radial velocity requires that the electron loose energy and spiral into the nucleus. Using the Haus condition, Applicant confirmed the radiative instability of the SQM electron for all of the solutions of the Schrodinger equation as given in Chp. 35 of Ref. 1.

In contrast, there is no radial motion for Applicant's stable solution as shown in Chp. 1 of Ref. 1. The motion is confined to the surface of a spherical shell. The radial velocity v in the Examiner's dispersion relationship is zero corresponding to a constant k and w for the transverse motion only. As shown previously in this Response, Applicant shows that a constant function (corresponding to spin angular momentum) plus time and spherically harmonic charge-density waves moving on the surface of a spherical shell (corresponding to orbital angular momentum) are stable to radiation according to Maxwell's equations. This was shown using the Haus condition and the Poynting Power Vector. The closed-form predicted results using these solutions match identically the observables such as the Stern Gerlach experimental result, the g factor, fine structure, Lamb shift, and hyperfine structure to an accuracy limited only by the accuracy of the fundamental constants which are the only parameters in the solutions.

The length dilation of the relationship between the radius for the lightlike frame relative to the electron's motion is correctly given by Eqs. (1.45) and (1.249).

A sphere comprised of current loops is trivially nonradiative. That the Examiner incorrectly predicts radiation clearly demonstrates his lack of an understanding of Applicants solution of the bound electron and the Haus condition for nonradiation.

The Examiner, addressing further aspects of Applicant's theory on Appendix page 16, helps make Applicant's case:

Apart from the fateful mistake described above, Applicant's condition for vanishing $K(s, \dot{u})$ is mathematically and conceptually incorrect, for being only fulfilled for a perfectly circular electron orbit. For general circular motion, the argument of Applicant's *sinc*

function, $2s \cdot r_n$, is not constant in time, because it is not a constant of motion, as described previously. Thus, Applicant's non-radiative condition applies only to a perfectly circular electron orbit (pure classical mechanics). General hydrino states must be radiative, in self-contradiction with Applicant's initial *postulate* (not a first principle).

As discussed above, the motion **IS** confined to motion on a spherical shell along perfectly circular paths. Thus, the Examiner is in agreement with Applicant that hydrino states are nonradiative since he states that "Applicant's non-radiative condition applies only to a perfectly circular electron orbit (pure classical mechanics)" which is exactly the case as given in Chp. 1, Chp. 5, and Chp. 6 of Ref. 1.

Furthermore, superconducting current loops are experimentally nondissipative. Such current loops are the basis function to construct the orbitsphere $n=1$ function in Chp. 1 of Ref 1. Since it is electrostatic and magnetostatic, it is trivially nonradiative.

Finally, the Examiner once again demonstrates a lack of familiarity with basic physical concepts, arguing on page 17 of the Appendix:

We see, in this one small part of Haus's radiationless condition alone, if has been proven that Applicant's GUT/CQM contains numerous mathematical and conceptual errors, all these in addition to those already discussed in the previous 05-07 Appendix, which also have not been properly argued. Moreover, Applicant's arguments not only violate the QM, but also the special relativity theory, electrodynamics, classical mechanics, and the classical wave theory as well.

The Examiner being a quantum theoretician does not grasp physical concepts and an understanding of Applicant's solution of the electron as demonstrated by his flawed arguments. Applicant has used Maxwell's equations and special relativity correctly as shown by the remarkable agreement between calculations and observation for hundreds of observables given in handbooks as shown in the following papers:

107. R. L. Mills, "Maxwell's Equations and QED: Which is Fact and Which is Fiction", *Physica Scripta*, submitted.
106. R. L. Mills, "Exact Classical Quantum Mechanical Solution for Atomic Helium Which Predicts Conjugate Parameters from a Unique Solution for the First Time", *Progress of Physics*, submitted.
102. R. L. Mills, "Exact Classical Quantum Mechanical Solutions for One-Through Twenty-Electron Atoms", *Physics Essays*, submitted.
94. R. L. Mills, "The Nature of the Chemical Bond Revisited and an Alternative Maxwellian Approach", *Physics Essays*, submitted.
80. R. L. Mills, "The Fallacy of Feynman's Argument on the Stability of the Hydrogen Atom According to Quantum Mechanics", *Fondation Louis de Broglie*, submitted.
58. R. L. Mills, "Classical Quantum Mechanics", *Physics Essays*, in press.
21. R. Mills, "The Grand Unified Theory of Classical Quantum Mechanics", *Int. J. Hydrogen Energy*, Vol. 27, No. 5, (2002), pp. 565-590.
17. R. Mills, "The Nature of Free Electrons in Superfluid Helium--a Test of Quantum Mechanics and a Basis to Review its Foundations and Make a Comparison to Classical Theory", *Int. J. Hydrogen Energy*, Vol. 26, No. 10, (2001), pp. 1059-1096.
5. R. Mills, "The Hydrogen Atom Revisited", *Int. J. of Hydrogen Energy*, Vol. 25, Issue 12, December, (2000), pp. 1171-1183.
1. R. Mills, *The Grand Unified Theory of Classical Quantum Mechanics*, September 2001 Edition, BlackLight Power, Inc., Cranbury, New Jersey, Distributed by Amazon.com; January 2004 Edition posted at www.blacklightpower.com.

This success can not be emulated by SQM. In sum, Applicant's theory and data overwhelmingly confirm the existence of lower-energy hydrogen and, thus, the operability of the claimed Invention.

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

BLACKLIGHT POWER, INC.)	<u>C.A. NO. 00-422 (EGS)</u>
)	
VS.)	WASHINGTON, D.C.
)	MAY 22, 2000
Q. TODD DICKINSON)	10:00 A.M.

TRANSCRIPT OF MOTIONS HEARING
BEFORE THE HONORABLE EMMET G. SULLIVAN
UNITED STATES DISTRICT JUDGE

APPEARANCES:

FOR THE PLAINTIFF: MICHAEL H. SELTER, ESQ.
JEFFREY A. SIMENAUER, ESQ.
JEFFREY S. MELCHER, ESQ.

FOR THE DEFENDANT: FRED E. HAYNES, ESQ.
KEVIN BAER, ESQ.

COURT REPORTER: FRANK J. RANGUS, OCR
U. S. COURTHOUSE, RM. 6822
WASHINGTON, D.C. 20001
(202) 371-0545

PROCEEDINGS RECORDED BY ELECTRONIC STENOGRAPHY; TRANSCRIPT
PRODUCED BY COMPUTER.

1 FORM AND A PATENT COULD ISSUE WITHOUT ANY MEANINGFUL REVIEW?

2 MR. BAER: WELL, NO, YOUR HONOR, THERE IS REVIEW. THE
3 PATENT EXAMINERS DO REVIEW THEM. UNFORTUNATELY, PATENT
4 EXAMINERS ARE SWAMPED AND SOMETIMES THINGS SLIP THROUGH. IN
5 THIS CASE, AT LEAST THE APPLICATION AT ISSUE IN THIS SUIT, IT
6 DOESN'T APPEAR THAT THE EXAMINER DISCUSSED THE FRACTIONAL
7 QUANTUM NUMBERS. NOW, PLAINTIFF WILL ARGUE THAT THEY DID, BUT
8 I CAN'T FIND ANYTHING IN THE RECORD WHERE THEY DISCUSSED A
9 FRACTIONAL END NUMBER. THAT'S THE QUANTUM NUMBER.
10 UNFORTUNATELY, THE ONE THAT ISSUED GOT THROUGH. BUT HERE WE
11 HAVE BEEN ABLE TO TAKE A SECOND LOOK AT IT AND WE HAVE SERIOUS
12 QUESTIONS ABOUT THE PATENTABILITY, AND WE DON'T WANT TO ISSUE
13 AN INVALID PATENT.

14 THE COURT: IF THE COURT AGREES WITH THE GOVERNMENT
15 THAT THE PATENT SHOULD NOT ISSUE, THERE ARE ADMINISTRATIVE
16 REMEDIES AVAILABLE TO THE PLAINTIFF?

17 MR. BAER: OH, ABSOLUTELY, YOUR HONOR.

18 THE COURT: THIS IS NOT A REJECTION. THIS IS MERELY
19 WHAT?

20 MR. BAER: IT'S A PROCEDURAL TOOL TO ALLOW EXAMINATION
21 TO CONTINUE. WHAT COULD HAPPEN, PLAINTIFF KEEPS TELLING US
22 THAT THEY'LL COME IN THE OFFICE AND THEY'LL PROVE IT'S
23 PATENTABLE, AND IF IT IS PATENTABLE, WE WILL ISSUE IT.

24 THE COURT: SO IT'S NOT AS IF THE PLAINTIFF IS OUT OF
25 COURT?

1 THE COURT: THEY'RE SO NOVEL THAT THEY REQUIRE
2 INVESTMENTS OF TIME, SIGNIFICANT INVESTMENTS OF TIME, TO
3 DETERMINE WHETHER OR NOT THEY ARE PATENTABLE, I ASSUME.

4 MR. BAER: THAT IS CORRECT, YOUR HONOR.

5 THE COURT: WHAT HAPPENED IN THIS CASE? THIS PATENT
6 WAS FILED A COUPLE OF YEARS AGO. IT LOOKS LIKE EVERYONE FELL
7 ASLEEP AT THE SWITCH UNTIL AFTER ONE PATENT WAS ISSUED AND THAT
8 TRIGGERED THIS. AFTER THE 935 PATENT WAS ISSUED, THEN THAT
9 TRIGGERED ALL SORTS OF SCRUTINY FOR THE 294.

10 MR. BAER: YOUR HONOR, IT IS FILED. THE EXAMINER
11 LOOKS AT IT. I BELIEVE THE EXAMINER ONLY HAS, IT IS LESS THAN
12 A WEEK, AND I BELIEVE THEY HAVE TO LOOK AT TWO OR THREE
13 APPLICATIONS A WEEK. SO VERY LITTLE TIME ACTUALLY WAS SPENT
14 LOOKING AT THIS APPLICATION. SO THE EXAMINER ISSUED SOME
15 OFFICE ACTIONS. IT WENT BACK AND FORTH AND EVENTUALLY HE
16 ALLOWED IT, BUT THERE WAS NOT A TWO-YEAR INVESTIGATION OF THIS.

17 YOU HAD ALSO ASKED, HAD THE OFFICE RUN ANY TESTS? WE
18 DON'T HAVE ANY ABILITY WITHIN THE AGENCY TO RUN THE TESTS.
19 THAT'S WHY WE WANT THE APPLICANT TO COME IN. AND ONCE AGAIN I
20 HAVE TO REMIND YOU THEY REQUESTED TO COME IN IN THEIR FORMAL
21 LETTER TO THE AGENCY: "LET US COME IN AND TALK TO YOU ABOUT
22 THIS BEFORE YOU DO ANYTHING." WE AGREED TO THAT. THEY'VE NOW
23 BACKED AWAY FROM THAT.

24 THE COURT: WHAT'S THE PREJUDICE TO THE GOVERNMENT IF
25 THIS PATENT ISSUES? I MEAN, THE PLAINTIFFS MAINTAIN IT WILL DO

1 ATTENTION TO THAT. THE PATENT NEVER ISSUED. NOW, NOT ALL OF
2 THOSE ARE FOR THIS REASON. SOME WOULD BE FOR INTERFERENCES.
3 SOME WOULD BE AT THE APPLICANT'S REQUEST. BUT IT'S NOT AN
4 UNCOMMON OCCURRENCE THAT THE AGENCY, AFTER THE ISSUANCE FEE IS
5 PAID, FINDS SOME REASON TO WITHDRAW THE PATENT.

6 THERE'S ALSO USUALLY A TIME LAG BETWEEN WHEN THE
7 NOTICE OF ALLOWANCE GOES OUT AND THE ISSUE FEE IS PAID, AND IN
8 THESE CASES THE ISSUE FEE IS PAID WITHIN DAYS. NOW, THAT'S NOT
9 TO SAY IT NEVER HAPPENS, AND MAYBE THAT'S THIS FIRM'S PRACTICE,
10 TO DO IT ALL THE TIME. IN MOST OF THE CASES I'VE SEEN, THERE'S
11 ALWAYS A LONG DELAY.

12 THE COURT: WAS THAT A SIGNIFICANT SUM OF MONEY?

13 MR. BAER: I BELIEVE IT'S AROUND A THOUSAND DOLLARS.

14 THE COURT: A THOUSAND DOLLARS. ALL RIGHT.

15 MR. BAER: IT'S NOT THAT SIGNIFICANT FOR A
16 CORPORATION.

17 THE COURT: IS IT SIGNIFICANT THAT, WHEN THE
18 APPLICATION FOR THE PATENT WAS APPROVED, THERE WERE NO REASONS
19 GIVEN? IS THAT USUAL OR NOT?

20 MR. BAER: THAT OFTEN HAPPENS ALSO, YOUR HONOR. THE
21 EXAMINERS ARE UNDER TREMENDOUS PRESSURE TO PRODUCE WORK, AND II
22 THEY'RE GOING TO APPROVE IT, THEY JUST APPROVE IT AND KIND OF
23 LET IT OUT THE DOOR. SOMETIMES, THEY DO PROVIDE REASONING, BU?
24 OFTEN THEY DON'T. IT IS NOT THAT SIGNIFICANT.

25 YOUR HONOR, IF THE COURT DECIDES THAT THE AGENCY HAS

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

BLACKLIGHT POWER, INC.,

Plaintiff,

v.

Q. TODD DICKINSON,
Commissioner of Patents,
United States Patent
& Trademark Office,

Defendant.

Civil Action No. 00-00422 EGS

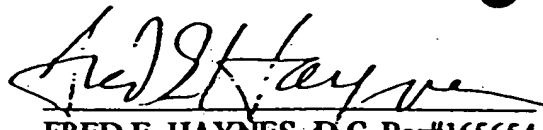
DEFENDANT'S MOTION FOR SUMMARY JUDGMENT

Pursuant to Fed. R. Civ. P. 56, defendant, by his undersigned attorneys, hereby moves this Court for an order granting summary judgment in his favor on the grounds that no genuine issue as to any material fact exists and that defendant is entitled to judgment as a matter of law. In support of this motion, the Court is referred to the accompanying memorandum of points and authorities and to the accompanying statement of material facts as to which there is no genuine issue. A draft order reflecting the requested relief is also attached.

Respectfully submitted,

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United States Attorney

MARK E. NAGLE, D.C. Bar #416364
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OF COUNSEL:

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MARSHALL HONEYMAN
ERIC GRIMES
Associate Solicitors
Office of the Solicitor
U.S. Patent and Trademark Office
Arlington, Virginia

neither arbitrary nor capricious. Plaintiff's '294 application is based on theories that are not generally accepted by the scientific community. The determination that one or more claims may be unpatentable is reasonable in light of the extraordinary claims asserted by plaintiff. *In re Chilowsky*, 229 F.2d 457, 462 (CCPA 1956) (alleged inventions that conflict with recognized scientific principles are required to overcome presumption of inoperativeness).

Plaintiff's description of its invention as "conductive, magnetic plastics that will revolutionize circuitry and aerospace engineering" (Complaint ¶ 9), as capable of providing a small battery charged to move an automobile 1000 miles at highway speeds without the use of fossil fuels (Complaint ¶ 9), and as "revolutionary technology" (Exhibit 9 at 3) provide further support for the Director's decision to reopen prosecution to ensure that a potentially invalid patent does not issue. These alleged accomplishments are astonishing by themselves, but when coupled with a new theory of quantum mechanics that allegedly is based on a medical doctor/ inventor deriving a new atomic theory that unifies Maxwell's Equations, Newton's Laws, and Einstein's General and Special Relativity (Ex. 2 at col.4), the combination provides ample reason for the USPTO to review the question of patentability.

As detailed in the accompanying statement of facts, the generally accepted understanding of the hydrogen atom is that its "ground state" is its lowest energy level and that its single electron can exist only with whole integer quantum numbers. (Ex. 1 at 210-11). In contrast to the conventional understanding of quantum mechanics, plaintiff believes that it can stimulate the hydrogen atom to go below its "ground state" and that fractional quantum numbers are possible for the hydrogen atom. These assertions are not known to the Group Director charged with examining this technology as generally accepted in the scientific community. (Ex. 5 at 5-6)

IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

BLACKLIGHT POWER, INC.)	<u>C.A. NO. 00-422 (EGS)</u>
)	
VS.)	WASHINGTON, D.C.
)	MAY 22, 2000
Q. TODD DICKINSON)	10:00 A.M.

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1 WHAT THEY ARGUE IN THEIR BELIEFS IT'S CAPABLE OF DOING, THIS
2 DISCOVERY.

3 MR. BAER: YOUR HONOR, BECAUSE --

4 THE COURT: ARE YOU ARGUING IT'S A FRAUD ON THE
5 PUBLIC? YOU'RE NOT ARGUING THAT. YOU NEVER SAID IT WAS A
6 FRAUD.

7 MR. BAER: YOUR HONOR, IT IS NOT -- WE DON'T BELIEVE
8 IT'S A VALID (PAUSE) -- IT'S NOT PATENTABLE BECAUSE IT'S NOT
9 VALID ACCORDING TO THE KNOWN RULES OF SCIENCE AND --

10 THE COURT: BUT IT'S NOT FRAUDULENT, THOUGH, IS IT?

11 MR. BAER: WELL (PAUSE) --

12 THE COURT: THAT'S NOT BEEN YOUR ARGUMENT UP TO THIS
13 POINT.

14 MR. BAER: NO, I DON'T THINK I WANT TO USE THE TERM
15 "FRAUD." DR. MILLS MAY BELIEVE HE'S INVENTED SOMETHING. WE
16 DON'T BELIEVE HE'S DONE THAT AND WE'VE ASKED HIM TO COME IN AND
17 PROVE THAT, AND THEY WILL HAVE AN OPPORTUNITY TO DO THAT. THE
18 HARM IS THAT THERE IS A PRESUMPTION OF VALIDITY ATTACHED TO AN
19 ISSUED PATENT. IT IS VERY HARD FOR A THIRD PARTY TO OVERCOME
20 THAT. THEY CAN EXCLUDE OTHERS FROM THE MARKET. IF SOMEONE
21 ACTUALLY INVENTS THIS, ASSUMING DR. MILLS HAS NOT INVENTED
22 THIS, IF SOMEONE COMES ALONG AND INVENTS IT IN THE FUTURE, THEY
23 COULD BE BLOCKED BY A VALID PATENT.

24 THE COURT: I SEE.

25 MR. BAER: SO THERE IS A HARM TO THE PUBLIC.

1 POSSIBLY DO THIS?" SO THERE'S AN EXAMPLE OF A THIRD PARTY
2 CONTACTING US, AND THERE'S NOTHING SINISTER ABOUT THAT. IT'S
3 JUST HOW THE AGENCY LEARNED ABOUT IT, AND THE REAL QUESTION WAS
4 THE DECISION, IS THE DECISION RATIONAL?

5 THE COURT: WHAT ABOUT THE REAL PREJUDICE TO THE
6 GOVERNMENT? COUNSEL MAKES A POINT. WHEN I ASKED THE QUESTION
7 BEFORE, HE SAID, WELL, THE PREJUDICE IS IF SOMEONE PRESENTS AN
8 IDENTICAL PATENT APPLICATION AND IS UNABLE TO PROVE
9 PATENTABILITY, THAT PERSON WILL BE PRECLUDED FROM RECEIVING A
10 PATENT.

11 MR. BAER: CORRECT. NOT ONLY RECEIVING A PATENT --

12 THE COURT: THE GOVERNMENT'S ARGUMENT, THOUGH, IS THAT
13 THIS INVENTION, IF IT IS ONE, CANNOT BE PATENTED BECAUSE IT'S
14 NOT FRAUDULENT, BUT IT'S NOT VIABLE?

15 MR. BAER: YOUR HONOR --

16 THE COURT: IT'S NOT TRUE? WHAT IS IT?

17 MR. BAER: -- IF THIS APPLICATION WAS THE CURE FOR
18 CANCER BUT WE DIDN'T BELIEVE THEY HAD THE CURE FOR CANCER, BUT
19 WE ISSUED IT ANYWAYS, WHEN SOMEONE COMES ALONG FIVE YEARS FROM
20 NOW WITH A CURE FOR CANCER, THEY WOULD BE PRECLUDED BY THIS
21 PATENT. PLAINTIFF COULD EXCLUDE THEM FROM THE MARKETPLACE.

22 THE COURT: RIGHT.

23 MR. BAER: YOU CAN'T PRACTICE THIS.

24 THE COURT: WHAT YOU'RE SAYING IS, THIS INVENTION
25 CONTRAVENES ALL THE KNOWN LAWS OF PHYSICS AND CHEMISTRY AND IT

1 CAN'T, IT JUST (PAUSE) -- ARE YOU SAYING IT'S NOT TRUE? IT'S
2 NOT VIABLE?

3 MR. BAER: IT IS NOT KNOWN AT THIS POINT.

4 THE COURT: NOT KNOWN AT THIS POINT. RIGHT.

5 MR. BAER: BUT THAT DOESN'T MEAN --

6 THE COURT: BECAUSE IT'S NOVEL.

7 MR. BAER: BECAUSE IT IS VERY NOVEL. IT IS
8 EXTRAORDINARILY NOVEL, AND IT'S NOT TO SAY THAT THEY HAVE NOT
9 INVENTED SOMETHING. MAYBE THEY HAVE, BUT IT NEEDS TO GO
10 THROUGH FURTHER ADMINISTRATIVE REVIEW. AND IF THEY TRULY
11 HAVEN'T DONE THIS, CREATED THIS NEW ENERGY SOURCE, BUT THEY GET
12 A PATENT, THEY CAN PRECLUDE EVERYONE ELSE FROM EVER, FOR THE
13 NEXT 17 YEARS AT LEAST, FROM PROSECUTING THIS INVENTION. SO
14 WHEN SOMEONE COMES ALONG AND INVENTS THIS TEN YEARS DOWN THE
15 ROAD, PLAINTIFF CAN SAY, "OH, YOU CAN'T DO THAT" OR "YOU HAVE
16 TO PAY ME ROYALTIES."

17 THE COURT: SO THE ANSWER TO MY QUESTION IS, THE
18 GOVERNMENT IS NOT PREJUDICED AT ALL. YOU JUST ANTICIPATE
19 PREJUDICE TO SOMEONE ELSE IN THE FUTURE IF SOMEONE ELSE IS ABLE
20 TO DEMONSTRATE THAT THE ENERGY SOURCE EXISTS.

21 MR. BAER: THE PREJUDICE WOULD ALSO BE, WE'D BE
22 ORDERED TO ISSUE A PATENT THAT WE DO NOT BELIEVE AT THIS POINT
23 IS PATENTABLE, AND THAT IT'S NOT A REGISTRATION SYSTEM AT THE
24 PATENT AND TRADEMARK OFFICE. CONGRESS HAS CHARGED THE DIRECTOR
25 WITH EXAMINING PATENT APPLICATIONS, AND THAT'S WHAT WE'RE

IN THE
UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF COLUMBIA

BLACKLIGHT POWER, INC.

Plaintiff,

v.

Q. TODD DICKINSON,
Commissioner of Patents

Defendant.

No. 00 0422 EGS

**REPLY IN SUPPORT OF
PLAINTIFF'S MOTION TO AMEND THE SCHEDULING ORDER**

**I. The Court Should Reject the Patent Office's Attempt
To Raise Issues Outside of the Administrative Record.**

Plaintiff's present Motion to Amend the Scheduling Order seeks an extension to provide the Court sufficient time to reach a decision on the merits of the parties' pending cross-motions for summary judgment and an opportunity for either party to move for a stay pending any appeal that might be taken from that decision.¹ The posture of this case awaiting summary judgment did not just happen by accident. Rather, it resulted from the parties' negotiated settlement in which BlackLight agreed to withdraw its previously-filed application for a temporary restraining order and preliminary injunction in exchange

¹ Plaintiff proposed that the stay extend ten days after any judgment to allow the losing party (whether it be Plaintiff or the Patent Office) to seek a stay pending appeal. The extra ten days was for both parties' convenience because Plaintiff believed that pending any appeal, the Patent Office would not want to be directed to issue a patent, just as Plaintiff would not want an adverse office action to issue. Thus, contrary to the Patent Office's argument (Def. Opp. 4), the extra ten days suggests nothing about Plaintiff's belief in the strength of its case.

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As previously noted in Plaintiff's patent counsel's Declaration executed on April 4, 2000, Group Director Kepplinger told him that Director Dickinson directed her to review the '294 application after he received communications from undisclosed third-party sources. Exhibit 1 to Plaintiff's Motion for Summary Judgment. Although Group Director Kepplinger did not at that time disclose the third-party source, Plaintiff has done some discovery of its own and now knows why it is no coincidence that the Patent Office relied so heavily on the statements of Dr. Park, a physicist with the American Physical Society (APS), in its March 22 Decision, as this was not the first time the two have had close ties. As the Court may recall, another physicist, Dr. Peter Zimmerman, Chief Scientist for the U.S. Department of State, published an Abstract for an upcoming speech to be delivered to the APS boasting that the State Department and the Patent Office "have fought back with success" against BlackLight. Plaintiff's Reply in Support of its Motion for Summary Judgment, at 2 n.1. In an interview with Dr. Zimmerman to find out the source of those comments, he claimed to be only a "receiver" of information, not a "donor" and that it was Dr. Park who has had contact with someone in the Patent Office that Park specifically refers to as "Deep Throat." July 10, 2000, Letter to Thomas Heinemann, Esq., from Jeffrey A. Simenauer, Esq. (Exhibit 1 hereto).

While the dispute about what led to Group Director Kepplinger's review should have no bearing on the Court's decision on the pending motions for summary judgment, it does help explain why the Patent Office is now anxiously searching for some other excuse to justify its procedural missteps.

**SUMMARY OF DISCUSSIONS HELD AT THE
U.S. PATENT OFFICE ON FEBRUARY 11, 2003 REGARDING
BLACKLIGHT POWER PATENT APPLICATIONS**

- The following bullet points summarize the discussions that took place on February 11, 2003, between representatives of BlackLight Power, Inc. ("BlackLight" or "BLP") and the U.S. Patent and Trademark Office ("PTO" or "Patent Office"). These discussions included a formal Interview regarding the patentability of pending BlackLight patent applications relating to novel hydrogen technology.
- Attending the Interview on behalf of BLP were the Applicant Dr. Randell L. Mills, his counsel Jeffrey S. Melcher and Jeffrey A. Simenauer, and BLP Director Dr. Shelby Brewer. Attending the Interview on behalf of the Patent Office were Quality Assurance Specialist Douglas McGinty, who lead the Interview, Primary Examiners Wayne Langel, Stephen Kalafut, and William Wayner, and Supervisory Primary Examiners Patrick Ryan and Stanley Silverman (referred to collectively as "the Examiners"). Also attending the Interview as an observer was Ted C. Liu, Senior Legislative Assistant for Congressman David Wu, who represents the 1st District of Oregon.
- Prior to the Interview, Mr. Liu spoke by telephone with Congressional Affairs Specialist Talis Dzenitis in the PTO's Legislative and International Affairs Office to discuss his reasons for attending the Interview. Mr. Liu explained to Specialist Dzenitis that a constituent associated with BLP had contacted Congressman Wu complaining of irregular procedures the PTO has been using in connection with the company's pending patent applications. The procedures complained of included the PTO's withdrawal of five applications approved by Examiners Langel and Kalafut for issuance as patents and the subsequent rejection of those and other BLP applications, and the use of a "secret commit" to determine the patentability of BLP's products. ~~Specifically, BLP representatives expressed concern over the role that certain competitors—the American Physical Society (APS) and its spokesman, Dr. Robert Park, in particular—may have had in influencing a secret PTO committee charged with evaluating and rejecting BLP's pending applications.~~ Specialist Dzenitis informed Mr. Liu that no such "secret committee" exists at the Patent Office.
- Following the formal phase of the Interview, Mr. Liu, Dr. Mills, and his counsel had extended discussions with Examiner Langel. During those discussions, Examiner Langel denied authoring the substantive Office Actions rejecting BLP's patent applications, even though those Actions bear his signature. Langel was the Examiner who, with over 28 years of experience, originally issued Notices of Allowance in three of BLP's withdrawn patent applications. During the extended discussion, he reaffirmed his view that BLP is entitled to patents on its novel hydrogen technology and that he wanted to issue those patents. Examiner Langel then explained, however, that there were other individuals with higher authority who were responsible for drafting the substantive Office Actions he signed and for ultimately deciding whether to issue BLP its patents.
- Examiner Langel reported that he did not know the identity of those individuals, except for one Examiner, Vasu Jagannathan, whom he described as someone who "had something to do with the Office Actions." That observation was confirmed in a PTO letter addressed to Applicant's counsel, dated February 12, 2001, identifying Examiner Jagannathan as someone who was "directly involved in the creation of the Office Action [filed in App'n Ser. No. 09/009294]." In view of Examiner Jagannathan's involvement, Applicant's counsel requested several times that the Examiner appear at the February 11 Interview so that any remaining concerns he may have over the patentability of

Applicant's novel hydrogen technology could be addressed. That request was denied and Examiner Jagannathan did not attend the Interview.

- Applicant and his counsel have been seeking information relating to the identify of all PTO personnel and outside parties who have reviewed, contributed, or otherwise been involved in, or consulted on, the creation of the substantive Office Actions rejecting BLP's pending patent applications. These Office Actions are exemplified by the September 1, 2000 Office Action and attached 9-page Appendix (Paper No. 27) and the July 3, 2001 Final Office Action with the 68-page "Attachment to Response to Applicants' Arguments" (Paper No. 34), both entered in U.S. Serial No. 09/009,294. The PTO has not only denied Applicant this information, but has also denied it to five current and former U.S. Senators—Ron Wyden, Gordon Smith, Jon Corzine, Robert Torricelli, and Max Cleland. Nor has the PTO provided any information relating to those individuals within and outside the Patent Office who might have played a role in the withdrawal from issue of BLP's five allowed patent applications. To avoid further confrontation, Applicant's counsel did not raise these issues at the present Interview, but are still seeking the requested information, which is germane to the prosecution of BLP's pending applications.
- Dr. Mills began the Interview with a general discussion of his novel hydrogen technology and a presentation of experimental evidence confirming its operability. Specifically, Dr. Mills explained how independent laboratory studies, including those conducted at Los Alamos and NASA, and other highly reliable scientific data demonstrated the existence of lower-energy states of hydrogen underlying his technology. During that presentation, the Examiners—with the exception of Examiner Langel—raised theoretical arguments why lower-energy hydrogen could not exist, but did not analyze or otherwise address to any significant degree the specific scientific data presented proving its existence. Instead, the Examiners raised general criticisms regarding the alleged unreliability of that data, which they believe justified according it little or no weight.
- Among the criticisms raised was Examiner Wayner's reference to other inventions that have been the subject of much ridicule, such as perpetual motion energy devices, cold fusion technology, and 100-miles-per-gallon carburetors. Examiner Wayner compared those technologies to BLP's novel hydrogen chemistry by asking the question: "How is your invention any different?" Applicant responded by pointing out the significant differences between those technologies. Unlike the nonsensical inventions mentioned by Examiner Wayner, Dr. Mills explained that he has a working prototype energy cell in operation and has actually produced novel chemical compounds based on his lower-energy hydrogen technology. Dr. Mills also has submitted a substantial body of corroborating experimental evidence that demonstrates the existence of lower energy states of hydrogen, which the PTO has to this day essentially ignored.
- Examiner Wayner then questioned why, if BLP's technology was such an important discovery, the company had not yet developed a commercial device for producing energy. Applicant noted the high costs associated with developing a commercial product and explained that BLP was looking to license patents for its technology to commercial businesses—assuming those patents are ever issued. Applicant's counsel then asked Examiner Wayner whether he was introducing a new patentability standard requiring BLP to produce a commercial device before he would allow a patent to issue. Examiner Wayner denied that was the case and, in response to a specific question from Mr. Liu, affirmed that indeed an Applicant does not need to prove commercial applicability to secure a patent for his invention.

- Examiner Wayner further questioned why BLP had so many detractors, specifically naming Dr. Robert Park, spokesman for Applicant's main competitor, the APS. Applicant was astonished by the Examiner's reference to Dr. Park, since he is the APS lobbyist Applicant has identified to the PTO as having a "Deep Throat" PTO contact with access to confidential information. Applicant's counsel tried raising the issue of Dr. Park's agenda and obvious motives for criticizing BLP's competing technology, namely that the APS lobbies Congress for, and ultimately receives, hundreds of millions of dollars in government funding for its pet projects. Specialist McGinty refused to discuss the matter and suggested that BLP has a "similar agenda," noting BLP's contract with NASA. Applicant corrected the Examiner, explaining that BLP does not receive any government funding for its research. Specialist McGinty had no response.
- Examiner Wayner then raised questions regarding the integrity of the scientific evidence presented by Dr. Mills. Included in that evidence was spectroscopic data, which counsel explained is tantamount to a "chemical fingerprint." Counsel further noted that even Dr. Robert Park—whom Examiner Wayner identified as BLP's chief antagonist—has proclaimed the reliability of spectroscopic data. Indeed, in a published article that the PTO has used to reject BLP's applications, Park had this to say about the reliability of spectral data:

The energy states of atoms are studied through their atomic spectra—light emitted at very specific wavelengths when electrons make a jump from one energy level to another. The exact prediction of the hydrogen spectrum was one of the first great triumphs of quantum theory; it is the platform on which our entire understanding of atomic physics is built. The theory accounts perfectly for every spectral line.

There is no line corresponding to a "hydrino" state. Indeed there is no credible evidence at all to support Mills' claim. [*The Washington Post*, January 12, 2000]

- Yet when Dr. Mills tried to present this highly reliable data showing the spectral lines corresponding to a lower-energy hydrogen, *i.e.*, "hydrino," state, Examiner Wayner stated that "spectroscopic lines are meaningless" and "don't mean a hill of beans" to him.
- Specialist McGinty and Examiner Wayner then questioned Applicant about how one would know whether his scientific test data confirming the existence of lower energy states for hydrogen is accurate. Applicant responded by noting that the test data was conducted by highly qualified Ph.D. chemists, many of them representing independent laboratories. Applicant further noted that the data—which has cost BLP tens of millions of dollars to produce—has now been extensively peer-reviewed in over 50 published, or soon to be published, articles appearing in prestigious scientific journals. Among the journals specifically mentioned at the Interview were: *Journal of Applied Physics* and *Journal of Molecular Structure*.
- Applicant was shocked by the refusal of Specialist McGinty and Examiner Wayner to accept as reliable the scientific data appearing in these published journal articles. Applicant's counsel reminded the Examiners of a previous Interview held February 21, 2001, during which Applicant also presented experimental evidence of lower energy states of hydrogen. Counsel recalled how Examiner Jagannathan who led that Interview—but refused to show up to this one—advised Dr.

Mills that he would give serious consideration to evidence of lower-energy hydrogen only if it was submitted in articles for peer review and published in scientific journals.

- Applicant's counsel noted that, even though the PTO has never provided any legal authority for imposing a newly minted patentability standard requiring the publication of test data in peer-reviewed journal articles, Applicant nonetheless accepted Examiner Jagannathan's requirement. Counsel further noted that with now over 50 such articles—and another 30 on the way—Applicant has far exceeded the patentability standards improperly set by the Patent Office.
- Having met those inflated standards, Applicant's counsel expressed frustration that the PTO still refuses to seriously consider and analyze the scientific data published in the required journal articles. Specialist McGinty and Examiner Wayner indicated that they were not qualified to evaluate that data. When asked who was responsible for evaluating the data, Specialist McGinty stated it was the other Examiners of record, Langel and Kalafut.
- Specialist McGinty also asked what assurances Applicant could provide that the published data was actually peer reviewed. Applicant could only state what is a known fact—that to get scientific data published in a journal article, it must first go through a rigorous peer-review process.
- Applicant's counsel then raised the issue of changing standards for patentability that the PTO has continually imposed on Applicant through the examination process. For instance, Counsel specifically mentioned prior Office Actions claiming that Applicant's lower-energy hydrogen technology violates "physical laws" without identifying which such laws were supposedly being violated, and then requiring Applicant to prove otherwise. Counsel also read from a recent Office Action dismissing Applicant's scientific data out of hand for failing to prove the invalidity of quantum theory:

The request for reconsideration has been entered and considered but does not overcome the rejection . . . because there is no evidence presented which would prove applicant's contention that the theory of quantum mechanics is invalid." [October 7, 2002 Office Action entered in U.S. Serial No. 09/110,717]

- Counsel also mentioned that when Applicant recently submitted additional peer-reviewed journal articles offering further proof of lower-energy states of hydrogen—in accordance with the standards imposed by Examiner Jagannathan—the author(s) of a recent Office Action criticized that submission as being merely "cumulative."
- Expressing frustration over the PTO's lack of consistent patentability standards to guide Applicant, his counsel requested that Specialist McGinty provide such guidance. Specialist McGinty again raised his concern over the integrity of the experimental evidence and indicated that he would be more receptive to that evidence if it was validated by independent third parties. Applicant explained to Specialist McGinty that evidence dating back over four years includes independent third-party verification, to which the Specialist had no response. Applicant's counsel also pointed out that Specialist McGinty's unfounded concern over the lack of such verification demonstrates the PTO's obvious failure to have reviewed and analyzed the data in any detail.

- Further demonstrating this lack of familiarity with the record, Specialist McGinty criticized Applicant's experimental evidence as a whole by referring numerous times to the high-power plasma data. Applicant repeatedly pointed out to him that the plasma data was but a small fraction of the submitted data and that it was presented primarily to provide additional support for BLP's plasma-related applications. Most of the other scientific data submitted relates to a broad range of analytical studies demonstrating that lower energy states of hydrogen exist. For example, regarding those applications relating to novel chemical compounds, Applicant pointed Specialist McGinty to the extensive spectroscopic data supporting the identification of those compounds, but he apparently did not understand the significance of that data. For example, Specialist McGinty stated that the NMR data confirming lower-energy hydrogen could have been due to nitrogen. As Applicant explained, however, as a matter of basic chemistry, that NMR data only shows protons and no other element but hydrogen is in the data range.
- In response to Specialist McGinty's reservations over issuing Applicant his patents, Applicant's counsel raised questions regarding who had the ultimate authority to make that decision. Counsel expressed concern that the pending applications were being examined in secret and that without knowing who had the authority to issue the patents, Applicant was unfairly being denied the opportunity to present his case to the decision-maker. Specialist McGinty stated in no uncertain terms that Examiners Langel, Kalafut, and Wayner, as the signatories of the Office Actions, had "full authority" to prosecute the pending applications and to issue Applicant his patents. Notably, that statement contradicts Examiner Langel's comment following the Interview that other, unknown individuals have that authority, for if he did, Applicant already would have been granted his patents.
- Upon hearing Specialist McGinty's statement, Applicant's counsel immediately turned to Examiner Langel and asked him point blank whether, after studying the experimental evidence of record, he still believes that BlackLight's patent applications were allowable. The Examiner replied, "Yes, they're still allowable." Counsel then asked Examiner Langel whether, following the Interview, he was prepared to allow the claims and issue BlackLight its patents in those applications assigned to him, to which the Examiner replied, "fine with me."
- Specialist McGinty expressed immediate discomfort in agreeing to allow any claims at the Interview. Specifically, he raised a concern that even if the PTO ultimately found Applicant's claimed technology to be operable, there were still issues of novelty and nonobviousness to be addressed. Applicant's counsel expressed surprise by that statement given that the PTO has taken the position for years that Applicant's inventions are inoperable and that lower-energy hydrogen cannot possibly exist. Counsel pointed out the obvious contradiction in Specialist McGinty's statement that the PTO may now still need to conduct a search to see if lower-energy hydrogen does in fact exist.
- Applicant's counsel further recalled his own personal experience as an Examiner and the PTO's examination guidelines in effect at that time. When examining an application, the Examiner was expected to evaluate not only the operability of the claimed invention, but also, at the same time, the novelty and nonobviousness of that invention. Counsel again turned to Examiner Langel to confirm that this was his understanding. He replied that it was and, in fact, stated that the first thing he did was to conduct a thorough prior art search to see if he could "knock out" BLP's applications in the easiest way possible. Examiner Langel confirmed that he was unable to do so since the result of that

search turned up no applicable prior art, which is why he originally allowed the BLP applications assigned to him.

- Applicant's counsel acknowledged Specialist McGinty's position and tried to reassure him that they would work with him to alleviate any remaining concerns he might have in issuing BLP its patents. Counsel then specifically asked the Specialist to articulate how Applicant might accomplish that mutually beneficial goal. In response, Specialist McGinty indicated that, in the next Response to the pending Office Actions, Applicant should focus on identifying the experimental data derived by independent third party testing, as opposed to test data derived solely by Applicant.
- Specialist McGinty further expressed concern over whether such test data, even assumed to be reliable, was commensurate with the scope of the claims of the various applications to adequately support patentability. Applicant's counsel restated their belief that the test data did adequately support the claimed subject matter. Counsel, however, recommended that they go through the claims one-by-one with each of the assigned Examiners to see if some agreement can be reached as to those claims that are adequately supported and for which patents can be issued. As for the remaining claims that the PTO believes are not adequately supported by the scientific data, Applicant would not be prejudiced in continuing to seek broad claim coverage through continued prosecution. Specialist McGinty agreed that this sounded like a reasonable way to proceed. This understanding was memorialized in the Interview Summary Form as follows:

ATTACHMENT TO INTERVIEW SUMMARY FORM

Applicant requested that the following points discussed at the Interview held on February 11, 2003 be included as an Attachment to the Interview Summary Form.

Applicant's counsel and the Examiners in attendance at the Interview agreed to meet again at a future date, either in person or by telephone, to continue discussions regarding the patentability of Applicant's pending patent applications. Specifically, the Examiners expressed concern that Applicant's experimental evidence be commensurate with the scope of the claims. To address that concern, Applicant's counsel agreed with the Examiners to go through the patent applications claim-by-claim with the Examiners and demonstrate how the scientific data supports those claims.

For those claims that are supported by the data, the PTO agreed to issue those claims. For those claims that the PTO determines are not supported by the data, Applicant will continue to seek that broader claim coverage in subsequent proceedings.

uses in the ordinary course of its business. Should any other documentation that catalogs the contents of the off-site warehouse exist that would be of assistance in determining whether further responsive documents exist at the site, Dell shall provide that documentation to Tulip. Should Tulip request additional responsive documents based on the index or catalog, Dell shall promptly comply.

2. Dell shall provide Tulip with responsive e-mail and electronic documents for the following persons: John Stuewe, Jeff Clarke, Gary Curtis, Karl Steffes, Timothy Radloff, Ajay Kwatra, Abeye Teshome, Matthew Mendelow, Kevin Miller, Richard Chan, Neil Hand, Joseph Marengi, Eric Sholder, and Ro Parra.

Dell shall provide the e-mails in electronic form to Tulip's consultant, Ontrack. Ontrack shall then have the opportunity to review the e-mails electronically, by searching the e-mails using an agreed upon set of search terms. Any e-mails that contain one of those search terms shall be reviewed by Dell and produced to Tulip subject to confidentiality and privilege designations.

3. Dell shall use its best efforts to identify, recreate, and produce to Tulip the contents of Box 92. In addition, when Dell seeks to dispose of documents from its off-site warehouse, Dell should continue to submit to Tulip a list of documents that it intends to destroy, so that Tulip can request that certain boxes, which it believes are responsive, be maintained for a reasonable period to allow them to be searched, copied, and produced.

4. Dell shall endeavor to provide Tulip with the answers to its questions that its 30(b)(6) designee could not. Should another deposition be required, Dell shall pay the costs of that deposition.

5. The court will not at this time extend fact discovery from its current May 10, 2002 deadline. The parties should either submit to the court a mutually agreed-upon revised schedule or submit. In the event that the parties cannot come to an agreement on an extension, the parties shall submit a letter to the court setting forth their respective positions on whether the current discovery schedule should be extended.

BlackLight Power Inc. v. Rogan

U.S. Court of Appeals
Federal Circuit

No. 00-1530

Decided June 28, 2002

PATENTS

[1] Practice and procedure in Patent and Trademark Office — Fees (§ 110.03)

Practice and procedure in Patent and Trademark Office — Prosecution — Rules and rules practice (§ 110.0905)

U.S. Patent and Trademark Office may withdraw patent application from issuance after issue fee has been paid, even though second paragraph of 35 U.S.C. § 151 states that patent "shall issue" upon payment of fee, since opening clause of Section 151 conditions issuance on whether "applicant is entitled to a patent under the law," and since Section 151 does not prohibit PTO from interrupting sequence of procedures for notice of allowance and issuance if PTO officials reasonably believe that condition has not been met.

[2] Practice and procedure in Patent and Trademark Office — Fees (§ 110.03)

Practice and procedure in Patent and Trademark Office — Prosecution — Rules and rules practice (§ 110.0905)

U.S. Patent and Trademark Office is not required to make final determination of unpatentability before withdrawing application from issue pursuant to 37 C.F.R. § 1.313(b)(3), which permits PTO to withdraw application after payment of issue fee on ground of "unpatentability of one or more claims," since PTO's responsibility for issuing sound and reliable patents, complexity of examination process, and potential for error weigh in favor of according PTO latitude to withdraw application without final determination of unpatentability if responsible PTO official reasonably believes application may have been allowed in error, and exigencies of time do not allow for such final determination.

[3] Practice and procedure in Patent and Trademark Office — Fees (§ 110.03)

Practice and procedure in Patent and Trademark Office — Prosecution — Rules and rules practice (§ 110.0905)

U.S. Patent and Trademark Office did not act in arbitrary or capricious manner by withdrawing patent application from issue pursuant to 37 C.F.R. § 1.313(b)(3), which permits PTO to withdraw application after payment of issue fee on ground of "unpatentability of one or more claims," since PTO group director who requested that application be withdrawn, being generally advised of application's scope, reasonably believed that it had not been adequately examined, and took only available action to return application to examination, and since that summary action was reasonably within scope of agency's authority.

Appeal from the U.S. District Court for the District of Columbia, Sullivan, J.; 55 USPQ2d 1812.

Action by BlackLight Power Inc. against James E. Rogan, in his capacity as Director of the U.S. Patent and Trademark Office, alleging that withdrawal of patent application from issue by PTO, after plaintiff had received notice of allowance and paid issue fee, violated Administrative Procedure Act. Plaintiff appeals from grant of summary judgment for defendant. Affirmed.

Donald R. Dunner and J. Michael Jakes, of Finnegan, Henderson, Farabow, Garrett & Dunner, Washington, D.C.; Michael H. Selter and Jeffrey S. Melcher, of Manelli, Denison & Selter, Washington; Jeffrey A. Simenauer, Washington, for plaintiff-appellant.

John M. Whealan, Marshall S. Honeyman, Stephen Walsh, and Henry G. Sawtelle, of Office of the Solicitor, U.S. Patent and Trademark Office, Arlington, Va., for defendant-appellee.

Before Newman, Clevenger, and Schall, circuit judges.

Newman, J.

The question on appeal is whether the Director of the Patent and Trademark Office had the authority summarily to withdraw BlackLight's patent application from issue, following Notice of Allowance, payment of the issue fee and notification of the issue date, and with

publication of the drawing and claim in the Official Gazette. We conclude that such withdrawal was within the scope of the Director's authority and responsibility for performing the mission of the Patent and Trademark Office, when viewed in light of the unusual circumstances of this case. The district court's judgment is affirmed.¹

BACKGROUND

BlackLight Power Inc. conducts research into new sources of energy. BlackLight is the owner of United States Patent Application No. 09/009,294 entitled "Hydride Compounds." As described in BlackLight's brief, the inventions claimed in this and several related patent applications and an issued patent are directed to new energy technology derived from hydrogen compounds, and new compositions including conductive magnetic plastics and corrosion-resistant high-strength coatings.

During examination of the '294 application, the examiner initially rejected the claims on various grounds including operability under 35 U.S.C. § 101 and enablement and definiteness under § 112. After further prosecution including discussions of experimental results and the submission of samples, the examiner withdrew the rejection and allowed the claims. A Notice of Allowance was issued on October 18, 1999, the issue fee was paid, and issuance was noticed for February 29, 2000.

Another BlackLight patent application, entitled "Lower-Energy Hydrogen Methods and Structures," issued as United States Patent No. 6,024,935 on February 15, 2000. Shortly thereafter, prompted by an outside inquiry, the Director of the Group that had examined these applications was made aware of both the '935 patent and the imminent issuance of the '294 application. By Declaration filed in the district court, Group Director Kepplinger stated that upon reading the patent her "main concern was the proposition that the applicant was claiming the electron going to a lower orbital in a fashion that I knew was contrary to the known laws of physics and chemistry." Director Kepplinger believed that the '935 patent and the '294 application were directed to similar subject matter, and contacted Robert Spar, Director of the Special Program Law Office in the Office of the Deputy Assistant Commissioner for Patents. Director Spar stated by

¹ *BlackLight Power, Inc. v. Dickinson*, 109 F. Supp.2d 44, 55 USPQ2d 1812 (D.D.C. 2000).

Declaration that Director Kepplinger expressed concern that the '294 application "possibly had serious and substantial patentability problems and asked me to withdraw it from issue for further review."

On February 17, 2000 a Notice was issued to BlackLight, stating that the '294 application "is being withdrawn from issue pursuant to 37 C.F.R. 1.313 . . . to permit reopening of prosecution . . . [as] requested by the Director, Special Program Law Office." It is undisputed that no one involved in the withdrawal had reviewed the '294 patent application before issuance of the Notice; at the argument of this appeal the PTO Solicitor stated that the application was not available for review because the file was in Pennsylvania for printing of the patent document.

BlackLight's attorneys made prompt inquiries about the withdrawal. The PTO treated the inquiries as a petition to the Commissioner requesting reversal of the withdrawal. On March 22, 2000 the petition was denied by decision of Assistant Deputy Commissioner Kunin. The decision stated that "[t]he PTO has an obligation to issue patents that meet the statutory requirements for patentability," and concluded that Director Kepplinger did not act improperly in obtaining withdrawal of the '294 application for further examination. The decision referred to Director Kepplinger's concern about the correctness of the scientific theory set forth in the issued '935 patent, described in the decision as "the discovery that energy was released by stimulating hydrogen atoms to relax, and, in so doing, to shrink to smaller radii, and to also attain energy levels below their 'ground state' according to a 'novel atomic model,'" and Director Kepplinger's belief that the '294 application was based on the same theory. The decision stated that Commissioner Kunin's inspection of the '294 application "reveals that this invention is asserted [sic] to matters containing fractional quantum numbers. Such fractional quantum numbers do not conform to the known laws of physics and chemistry." The decision did not further discuss patentability, but stated that the application would be returned to examination.

Meanwhile, on March 1, 2000 BlackLight filed suit against the PTO Commissioner (now denominated "Director") in the United States District Court for the District of Columbia, charging that the withdrawal was contrary to law and in violation of the Administrative

Procedure Act, 5 U.S.C. § 701 *et seq.* BlackLight argued that 35 U.S.C. § 151 compels issuance when the issue fee has been paid:

35 U.S.C. § 151. If it appears that applicant is entitled to a patent under the law, a written notice of allowance of the application shall be given or mailed to the applicant. The notice shall specify a sum, constituting the issue fee or a portion thereof, which shall be paid within three months thereafter.

Upon payment of this sum the patent shall issue, but if payment is not timely made, the application shall be regarded as abandoned.

BlackLight argued that § 151 does not allow for withdrawal of an application by the PTO after the issue fee has been paid, and that the PTO officials exceeded their authority when they withdrew the '294 application.

BlackLight also argued that 37 C.F.R. § 1.313, the regulation cited by the PTO in withdrawing the application, violates the mandatory statutory language of § 151:

37 C.F.R. § 1.313

(a). Application may be withdrawn from issue for further action at the initiative of the Office or upon petition by the applicant

(b). Once the issue fee has been paid, the Office will not withdraw the application from issue at its own initiative for any reason except:

- (1) A mistake on the part of the Office;
- (2) A violation of § 1.56 or illegality in the application;
- (3) Unpatentability of one or more claims; or
- (4) For interference.

BlackLight stated that even if some form of withdrawal authority were deemed to exist as set forth in § 1.313(b), the PTO exercised that authority in an arbitrary and capricious manner, for there had been no determination of unpatentability of any of the claims allowed in the '294 application.

The district court held that the PTO's interpretation of its statutory authority is entitled to deference in accordance with *Chevron U.S.A., Inc. v. Natural Resources Defense Council, Inc.*, 467 U.S. 837, 842-44 (1984), and that the district court had so held in *Harley v. Leh-*

man, 981 F.Supp. 9 [44 USPQ2d 1699] (D.D.C. 1997). The court concluded that the PTO's action in withdrawing from issue the '294 application (and subsequently four related applications) was "reasonable," reasoning that 37 C.F.R. § 1.313(b) "functions as a last-chance procedural measure to observe the PTO's central mandate of issuing viable patents," and sustained the action of the PTO.

DISCUSSION

BlackLight argues that 35 U.S.C. § 151 commands the PTO to issue the patent upon payment of the issue fee, pointing out that the second paragraph of § 151 states that "the patent shall issue" upon payment of the fee. The PTO responds that § 151 starts with the conditional clause: "If it appears that applicant is entitled to a patent under the law"

[1] We agree with the PTO that while the words "shall issue" indeed impose a duty, the preface to § 151 places a condition on that duty. This preface conditions not only the issuance of the notice of allowance but also the ensuing steps of § 151. Statutory interpretation is "not guided by a single sentence or member of a sentence, but look[s] to the provisions of the whole law, and to its object and policy." *Dole v. United Steelworkers of Am.*, 494 U.S. 26, 35 (1990) (internal citations omitted).

Both paragraphs of § 151 together define the obligations and procedures of the notice of allowance and issuance. Section 151 does not prohibit the Office from interrupting the sequence if the condition set forth in the opening clause is reasonably believed not to have been met. Correct statutory interpretation is that which is "most harmonious with [the statutory] scheme and with the general purposes that Congress manifested." *Commissioner v. Engle*, 464 U.S. 206, 217 (1984) (internal citations omitted). We conclude that § 151 does not prohibit withdrawal by the PTO of a patent application after the issue fee has been paid.

BlackLight states that even if the PTO has statutory authority to withdraw applications, such withdrawal is limited to the grounds specified in the implementing rule, 37 C.F.R. § 1.313(b). BlackLight argues that none of these grounds applied, and specifically that ground (3), "unpatentability of one or more claims," requires a determination of unpatentability before the provision can be invoked,

and not a mere hint or suspicion. The district court held that § 1.313(b)(3) did not require a "final pronouncement" of unpatentability at the time of withdrawal.

[2] The object and policy of the patent law require issuance of valid patents. This responsibility, and the mission of the PTO, require authority to implement § 151 by taking extraordinary action to withdraw a patent from issue when a responsible PTO official reasonably believes that the subject matter may be unpatentable and that the application may have been allowed in error. The complexity of the examination process, and the potential for error in any human activity, weigh on the side of according the PTO latitude to withdraw an application from issue without a final determination of unpatentability when the exigencies of time do not allow for such determination.

[3] The decision to withdraw the application was made by PTO officials acting within their authority and in fulfillment of their obligation to assure that patents are properly examined, and valid. In *Skidmore v. Swift & Co.*, 323 U.S. 134, 139-40 (1944) the Court observed that agency actions are entitled to judicial respect when they are reasonably taken and in accordance with the "specialized experience" of agency officials and the "validity of its reasoning." Director Kepplinger, who is presumed to be knowledgeable in the fields of physics and chemistry, upon review of the '935 patent and being generally advised of the scope of the '294 application, reasonably believed that the '294 application had not been adequately examined, and took the only available action to return the '294 application to examination. That summary action was reasonably within the scope of the agency's authority and was not an arbitrary or capricious action. In *Baltimore & Ohio Railroad Co. v. United States*, 386 U.S. 372, 421 (1967) Justice Brennan remarked, in concurrence, on "the importance of leaving great flexibility with the agency to deal with emergency situations" in order to avoid harming that which the agency oversees. Such action must of course be reasonable under the circumstances and rare in occurrence, lest the emergency become the rule. But when necessary in order to fulfill the PTO's mission, with safeguards to the interests of the applicant including fair and expeditious further examination, we agree with the district court that the action taken is

a permissible implementation of the statute and regulation.

The PTO's responsibility for issuing sound and reliable patents is critical to the nation. It has not been shown that the PTO's exigent action was unreasonable in view of the scientific concerns of the Group Director and the imminent issuance of the patent. In *In re Alappat*, 33 F.3d 1526, 1535, 31 USPQ2d 1545, 1550 (Fed. Cir. 1994) (*en banc*) this court sustained extraordinary action when the Commissioner in good faith believed that such action was required to ensure the issuance of valid patents, observing that "the Commissioner has an obligation to refuse to grant a patent if he believes that doing so would be contrary to law."

The judgment of the district court is affirmed.

No costs.

AFFIRMED

Tamko Roofing Products Inc. v. Ideal Roofing Co.

U.S. Court of Appeals
First Circuit

Nos. 01-1382, 01-2273

Decided June 28, 2002

REMEDIES

[1] Monetary — Attorneys' fees; costs — Trademarks and unfair trade practices — Exceptional case (§ 510.0907.03)

Proper standard for awarding attorneys' fees and costs in connection with appeal, pursuant to 15 U.S.C. § 1117(a), does not require that appeal be frivolous in order to justify award of fees, or require fees to be automatically awarded whenever case is deemed "exceptional" at trial level; instead, appellate court will assess and weigh several factors, including whether appeal was on issues different from those that caused federal district court to find case exceptional, relative strengths or weaknesses of appellate issues, extent to which appeal prolonged, without adequate justification, particularly bad exceptional case, and whether losing party's position on appeal appears to be of a piece with

earlier malicious, fraudulent, deliberate, or willful acts of infringement, or is otherwise inequitable.

[2] Monetary — Attorneys' fees; costs — Trademarks and unfair trade practices — Exceptional case (§ 510.0907.03)

Prevailing plaintiff's application for award of attorneys' fees and costs in connection with defendant's unsuccessful appeal is denied, since defendant's appeal was on issues different from those that caused federal district court to find case "exceptional" under 15 U.S.C. § 1117(a), since defendant's arguments, although not strong, were respectable, and addressed areas of law that were unclear, and since appeal did not prolong, without justification, case that district court found to be exceptional.

Appeal from the U.S. District Court for the District of New Hampshire, DiClerico, J.

Action by Tamko Roofing Products Inc. against Ideal Roofing Co. Ltd. for trademark infringement, in which jury returned verdict for plaintiff. District court entered judgment awarding defendant's profits to plaintiff, ordering defendant to pay plaintiff's attorneys' fees, and issuing permanent injunction. Judgment was affirmed on appeal (61 USPQ2d 1865). On plaintiff-appellee's application for award of attorneys' fees and expenses incurred on appeal. Denied.

Christopher R. Benson, Marcy Hogan Greer, and Susan J. Hightower, of Fulbright & Jaworski, Austin, Texas, for plaintiff-appellee.

H. Joseph Hameline, Rosemary M. Allen, Geri L. Haight, and Michael B. Clapp, of Mintz, Levin, Cohn, Ferris, Glovsky & Popeo, Boston, Mass., for defendant-appellant.

Before Selya, circuit judge, Campbell, senior circuit judge, and Lynch, circuit judge.

Lynch, J.

Tamko Roofing Products, after winning its trademark infringement action at trial, and prevailing on a subsequent appeal by the infringer Ideal Roofing Company, brings this application for an award of reasonable attorneys' fees and expenses in connection with the appeal. We articulate the standards to be used in the analysis and deny Tamko's application because we find that Ideal's appeal did not



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**SPECIAL PROGRAMS OFFICE
DAC FOR PATENTS**

In re Application of
Mills et al.
Application No. 09/009,294
Filed: January 20, 1998
For: HYDRIDE COMPOUNDS

DECISION ON PETITION

This is in response to three communications submitted on February 28, 2000, regarding the application No. 09/009,294, requesting that the Commissioner review the action of the Director, Special Programs Law Office, with respect to the withdrawal of this application from issue. Although the three letters fail to clearly identify the submissions as a formal petition under 37 CFR 1.181 requesting the Commissioner to invoke his supervisory authority, the submissions are being treated as a single petition under 37 CFR 1.181(a)(3). The three letters are: (1) a February 28, 2000, letter to the Commissioner; (2) a February 28, 2000, letter to Director Spar; and (3) a February 28, 2000, letter to Director Kepplinger.

The petition is denied.¹

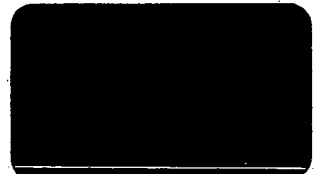
BACKGROUND

A Notice of Allowance and Issue Fee due was mailed in the above-identified application October 18, 1999, which set a statutory period of three months to pay the issue fee.

On October 22, 1999, the PTO processed applicant's issue fee payment, and the application in due course was assigned a patent No. (6,030,601) and an issue date of February 29, 2000.

On February 15, 2000, U.S. Patent No. 6,024,935 (the '935 patent), titled "Lower Energy Hydrogen Methods and Structures," issued to the assignee Blacklight Power, Inc., which patent named Randell Mills et al. as the inventors.

¹ This decision may be viewed as a final agency action within the meaning of 5 U.S.C. § 704 for purposes of seeking judicial review. See MPEP 1002.02.



On February 17, 2000, the Director of the Technology Center (Director) which had examined the application that issued as the '935 patent, learned that the '935 patent had issued.

Shortly thereafter, upon inspecting the '935 patent, the Director read, *inter alia*, that the invention therein was asserted to relate to the discovery that energy was released by stimulating hydrogen atoms to relax, and, in so doing, to shrink to smaller radii, and to also attain energy levels below their "ground state" according to a "novel atomic model." The Director was immediately struck by the assertion that the electron of a hydrogen atom could attain an energy level and orbit below the "ground state" corresponding to a fractional quantum number because such an assertion did not conform to the known laws of physics and chemistry. The Director was immediately aware that any pending application embodying such a concept raise a substantial question of patentability of one or more claims which would require reopening prosecution.

The Director further became aware that another pending application that embraced the above-noted contradiction to the known laws of chemistry and physics, was application 09/009,294 and that application was scheduled to issue as a patent on February 29, 2000.

In response to a request for prompt assistance from the Director in ensuring that the patent would not issue, the Director, Special Programs Law Office (SPLO) requested that the above-identified application be withdrawn from issue under 37 CFR 1.313 by the Office of Petitions, which resulted in the Notice to applicant mailed February 17, 2000.

Due to the lateness of the request of the Director, the PTO could not prevent the previously scheduled publication of the specification in the February 29, 2000, *Official Gazette*. Nevertheless, as the Notice of February 17, 2000, indicated that this application had been withdrawn from issue, the patent did not issue on February 29, 2000. See Harley v. Lehman, 981 F. Supp. 9, 44 USPQ2d 1699 (D.D.C. 1997). As is usual in such instances, an erratum notice was published in the *Official Gazette* on March 14, 2000.

STATUTE, REGULATION, AND EXAMINING PROCEDURE

35 U.S.C. § 6(a) provides, in part, that:

The Commissioner . . . may, subject to the approval of the Secretary of Commerce, establish regulations, not inconsistent with law, for the conduct of proceedings in the Patent and Trademark Office.

35 U.S.C. § 131 states:

The Commissioner shall cause an examination to be made of the application and the alleged new invention; and if on such examination it appears that the applicant is entitled to a patent under the law, the Commissioner shall issue a patent therefor.

37 CFR 1.313 states that:

(a) Applications may be withdrawn from issue for further action at the initiative of the Office or upon petition by the applicant. Any such petition by the applicant must include a showing of good and sufficient reasons why withdrawal of the application is necessary and, if the reason for the withdrawal is not the fault of the Office, must be accompanied by the fee set forth in § 1.17(i). If the application is withdrawn from issue, a new notice of allowance will be sent if the application is again allowed. Any amendment accompanying a petition to withdraw an application from issue must comply with the requirements of § 1.312.

(b) When the issue fee has been paid, the application will not be withdrawn from issue for any reason except:

- (1) A mistake on the part of the Office;
- (2) A violation of § 1.56 or illegality in the application;
- (3) Unpatentability of one or more claims;
- (4) For interference; or
- (5) For abandonment to permit consideration of an information disclosure statement under § 1.97 in a continuing application.

MPEP 1201 states in pertinent part that:

The Patent and Trademark Office in administering the Patent Laws makes many decisions of a discretionary nature which the applicant may feel deny him or her the patent protection to which he or she is entitled. The differences of opinion on such matters can be justly resolved only by prescribing and following judicial procedures. Where the differences of

opinion concern the denial of patent claims because of prior art or material deficiencies in the disclosure set forth in the application, the questions thereby raised are said to relate to the merits, and appeal procedure within the Patent and Trademark Office and to the courts has long been provided by statute.

The line of demarcation between appealable matters for the Board of Patent Appeals and Interferences (Board) and petitionable matters for the Commissioner of Patents and Trademarks should be carefully observed. The Board will not ordinarily hear a question which it believes should be decided by the Commissioner, and the Commissioner will not ordinarily entertain a petition where the question presented is an appealable matter.

OPINION

Petitioner asks that the Commissioner intervene and consider the instant petition. As to the merits of the petition, petitioner contends that the withdrawal from issue was a clear error as authorized by the Director of the Special Programs Law Office, and points to the communication addressed to the Director of Technology Center 1700 which accompanies the petition in support of his assertions. Petitioner's short letters to the Commissioner and Director Spar appear to rest on the theory that no new issue of patentability arose. As noted below, this argument is without merit. The letter to Director Kepplinger, which accompanied the two former letters, merely requests a meeting with PTO personnel to discuss the application that was withdrawn.²

The decision of the Director to request withdrawal from issue to reopen prosecution of this application did not constitute either the rejection of a claim or a decision adverse to the ultimate patentability of a claim. See In re Voss, 557 F.2d 812, 816, 194 USPQ 267, 270 (CCPA 1977). The PTO will issue in due course either a supplemental notice of allowance or an office action rejecting the claims. If the claims are rejected, Petitioner will then have a full opportunity to rebut the PTO's decision, including ultimately an appeal on the patentability merits to the Board of Patent Appeals and Interferences.

² In the time period between submission of the petition and this decision, petitioner has been offered an opportunity to provide whatever information it chooses to submit to the PTO at an on-the-record Office Interview. However, petitioner has refused to participate in such a meeting although such a meeting was requested by petitioner.

While it is understandable that petitioner is concerned about the withdrawal from issue of the above-identified application, the record does not show that the SPLO has acted beyond the scope of its authority in promptly assisting with the request from the Director to secure the withdrawal of this application from issue, or, based on that request, authorizing the Notice of February 17, 2000, for the Technology Center's purpose of reopening prosecution. Rather, that assistance is specifically within the SPLO's purview.

Section 1.313(b) of 37 CFR specifically authorizes the PTO to withdraw an application from issue to reopen prosecution. See Harley v. Lehman, 981 F. Supp. 9, 11-12, 44 USPQ2d 1699, 1701-02 (D.D.C. 1997) (applications may be withdrawn from issue even after payment of the issue fee in situations wherein the Group Director seeks to reopen prosecution). The withdrawal Notice of which petitioner complains merely apprised petitioner of the fact of withdrawal, and further, served the purpose of returning jurisdiction of the application to the Technology Center. See MPEP 1302.

In reaching her decision, the Director read the specification of the '935 patent and noted, *inter alia*, that the shrunken, lower energy hydrogen atoms or "hydrinos," are asserted in the '935 patent to react with other atoms, such as those of metals, to produce hydrides, which are the compounds claimed in the application at issue. The principles set forth in the '935 patent are not known to the Director to be generally recognized by the scientific community, but rather, are indicated in the '935 patent to be the discovery of one of the above-named inventors who asserted to have built further on quantum mechanics and derived a new atomic theory based on "first principles." The '935 patent further claims that its "novel theory . . . unifies Maxwell's Equations, Newton's Laws, and Einstein's General and Special Relativity."³

The concept that hydrinos can be created by hydrogen atoms relaxed to below their "ground state," was recognized by the Director not to conform with the known laws of chemistry and physics that are embraced by the scientific community. This lack of compliance with the known laws of chemistry and physics reasonably caused the Director to request withdrawal from issue of the instant application due to the Director's determination that one or more claims lacked patentability.

³ In its petition, petitioner refers to its invention as "revolutionary technology."

Furthermore, an inspection of Application No. 09/009,294 reveals that this invention is asserted to matters containing fractional quantum numbers. Such fractional quantum numbers do not conform to the known laws of physics and chemistry. For instance (1) page 5, lines 10-20, (2) page 11, lines 14-30, (3) page 68, lines 21-35, and (4) claim 17, all pertain to fractional quantum numbers which are not known to conform to the known laws of physics and chemistry.

The application did not issue as a patent on February 17, 2000, and thus, it did not enjoy the statutory presumption of validity, including operability, that is reserved only for an issued patent, when the Director requested withdrawal from issue. See 35 U.S.C. § 282. As such, the Director was not prohibited from determining anew that the technology embraced by the instant application lacked patentability of one or more claims.

That is, in light of (1) the application pertains to the field of chemistry (see title: "Hydride Compounds") which is often unpredictable, (2) the statement noted above by the Director which pertains to how these compounds are produced by a chemical reaction involving a hydrogen atom in a state that is not recognized by the scientific community which (3) the Director discerned was, on its face, contrary to generally accepted scientific principles, the reasonableness of the Director's decision to request withdrawal from issue to reopen prosecution is apparent. See In re Marzocchi, 439 F.2d 220, 223, 169 USPQ 367, 369-370 (CCPA 1971):

In the field of chemistry generally, there may be times when the well-known unpredictability of chemical reactions will alone be enough to create a reasonable doubt as to the accuracy of a particular broad statement put forward as enabling support for a claim. This will especially be the case where the statement is, on its face, contrary to generally accepted scientific principles.

See also In re Chilowsky, 229 F.2d 457, 462, 108 USPQ 321, 325 (CCPA 1956):

Thus, in the usual case where the mode of operation alleged can be readily understood and conforms to the known laws of physics and chemistry, operativeness is not questioned, and no further evidence is required. On the other hand, if the alleged operation seems clearly to conflict with a recognized scientific principle as, for example, where an applicant purports to have discovered a machine producing perpetual motion, the presumption of inoperativeness is so strong that very clear evidence is required to overcome it.

Further, while petitioner complains that the Notice of February 17, 2000, does not set forth any "new" issues of mistake, violation of 37 CFR 1.56, or unpatentability of one or more claims, in support of the withdrawal, 37 CFR 1.313 does not require the issue(s) be "new" for the Director's request for withdrawal from issue to be proper. Petitioner assumes that once a single PTO employee agrees with an applicant, even erroneously, no further review within the PTO is warranted or legally possible. Such a belief is without merit. For example, an examiner is not precluded from reopening prosecution to reinstate a rejection that had been made earlier in prosecution and withdrawn. See In re Freeman, 166 F.2d 178, 180, 76 USPQ 585, 586 (CCPA 1948).⁴ See also 37 CFR 1.196(b) (Board of Patent Appeals and Interferences may enter grounds of rejection not contained in the examiner's final rejection when applicant appeals final rejection).

While petitioner in the accompanying letter points to favorable testimonials from scientists and entrepreneurs regarding the "revolutionary technology" that the instant application is asserted to embody, this does not establish that either the Director, Technology Center 1700, or the Director, Special Programs Law Office, committed reversible error, nor that the Notice should be withdrawn. In contrast, mainstream newspapers have reported this same "revolutionary technology" is accompanied by controversy in the scientific community. See Baard et al., *Scientists and entrepreneurs have lots of ideas about new sources of energy; some may even be practical*, Wall St. J., Sept. 13, 1999, at R16; *Park, Perpetual motion: still going around*, Washington Post, Jan. 12, 2000, at H3.

The PTO has an obligation to issue patents that meet the statutory requirements for patentability. 35 U.S.C. § 131. See also In re Schmidt, 377 F.2d 639, 641, 153 USPQ 640, 642 (CCPA 1967); Markman v. Westview Instruments, Inc., 52 F.3d 967, 985

⁴ In Freeman, the reopening of prosecution set forth, *inter alia*, a ground of rejection (double patenting) that had been made earlier in prosecution, but had not been repeated in the final rejection, and, as such, was not an issue considered in the first appeal. After this rejection was affirmed by the Board of Appeals in the second appeal, counsel for Freeman argued unsuccessfully to the court that the circumstances suggested that this ground of rejection had not initially been repeated due to its "doubtful propriety." The CCPA noted that the rejection was nevertheless properly before it for consideration on the merits, and likewise affirmed. Id.

n.14, 34 USPQ2d 1321, 1334 n.14 (Fed. Cir. 1995), aff'd, 116 S. Ct. 1384, 38 USPQ2d 1461 (1996). It would be contrary to sound public policy for the PTO to issue a possibly invalid patent. See Harley, 44 USPQ2d at 1701. When, as here, a "revolutionary technology" has been reported in the public record as being viewed with skepticism by two physicists of repute (including the 1997 Nobel co-laureate in physics, see Baard et al.) and further, another professor of physics (see Park) publicly asserts that such "revolutionary technology" does not conform with the known laws of physics and chemistry, it is reasonable for the PTO to withhold issuance to ensure that all the statutory requirements for a patent have been herein met.

While petitioner points to U.S. Patent No. 6,024,935 recently issued to Mills, the law is well settled that the issuance of that patent cannot operate to discharge the PTO's obligation with respect to the patentability *vel non* of the instant application. See In re Margaroli, 318 F.2d 348, 138 USPQ 158 (CCPA 1963); In re Wright, 256 F.2d 583, 118 USPQ 287 (CCPA 1958); In re Launder, 212 F.2d 603, 101 USPQ 391 (1954). Rather, such issuance is immaterial to, and does not undermine, the reasonableness of the request of the Director to seek withdrawal from issue to permit reopening of prosecution, see In re Giolito, 530 F.2d 397, 188 USPQ 645 (CCPA 1976), or the reasonableness of the action of the SPLO in implementing that request.

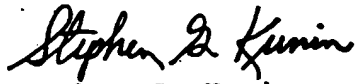
This conclusion of reasonableness on the part of the PTO vis-a-vis patentability is reinforced by the controversy surrounding this allegedly "revolutionary technology." As the PTO examines applications which embrace almost every field of endeavor, it is reasonable for the PTO to take appropriate steps to satisfy itself in the first instance, especially when a controversial "revolutionary technology" is involved, that the statutory requirements pertaining to the issuance of patents have been met. See generally Newman v. Quigg, 877 F.2d 1575, 11 USPQ2d 1340 (Fed. Cir. 1989); Ex parte Dash, 27 USPQ2d 1481 (BPAI 1992).

DECISION

A review of the record indicates that the Director, Special Programs Law Office, and the Director, Technology Center 1700, did not act improperly in withdrawing the application from issue. For the foregoing reasons, the withdrawal of the application from issuance is appropriate.

As such, the Notice of February 17, 2000, will not be rescinded. The above-identified application remains withdrawn from issue. An Office Action addressing the merits of the application or a supplemental Notice of Allowance will issue in due course.

This decision, as with all petitionable procedural matters, does not relieve or suspend applicant's obligation to continue prosecuting the patent application. 37 CFR 1.181(f) ("The mere filing of a petition will not stay the period of reply to an Examiner's action which may be running against an application, nor does it act as a stay of other proceedings."). In this application, no time limit is currently pending against applicant.



Stephen G. Kunin
Deputy Assistant Commissioner for
Patent Policy and Projects

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Mission Statement

The mission of *all* discussion within the Hydrino Study Group (HSG) is to determine whether classical physical laws describe reality on *all* scales.



*In This Forum,
Two Competing Views of Reality Engage in a Battle
for Total Control of Our Physics Paradigm!*

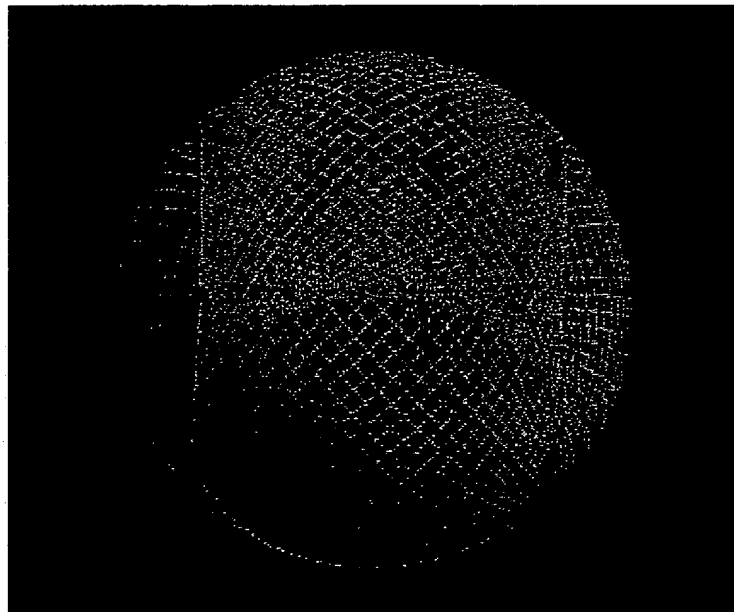
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concepts as renormalization, virtual photons, virtual annihilation and creation, and even propagator theory ... Mills places himself squarely in opposition to the greatest theoretical minds and experimental physicists of mid- and late twentieth century physics. ... If that troubles you guys, I'm sorry. But reality is the readings on my instruments--period."

--Dr. Peter Zimmerman

"A theory of physics must be based on directly measurable physical laws--period."

--Dr. Randell Mills



The *orbitsphere* represents the fundamental concept of Dr. Randell Mills' *Grand Unified Theory of Classical Quantum Mechanics* (GUTCQM)

Note:

This *entire theory* makes one central but tenuous assumption that the free electron is an extended, internally fluidized, two-dimensional "disk" particle with a radius comparable to that of a hydrogen atom. [Click here](#) for an AV animation of this concept. We are looking for experimental evidence to corroborate or refute this assumption. An inarguable refutation would destroy the *entire theory*, although the *laboratory data* may still require new physics:

to explain. Otherwise, the theory remains arguably true to some degree.

Theory in a Nutshell

Dr. Mills unifies the theories of Bohr, de Broglie, Maxwell, Einstein, Newton, etc via a new insight into the nature of the atom. Mills takes advantage of a 1981 Herman Haus paper that explains how charged particles may undergo acceleration without radiation. He then applies the mathematics of this insight into a new analysis of the hydrogen atom. His new model treats the electron, not as a point nor as a probability wave, but as a dynamic two-dimensional spherical shell surrounding the nucleus. The resulting model, called the "orbitsphere", provides a fully classical physical explanation for phenomena such as

1. Quantization
2. Angular momentum
3. Bohr magneton

Essentially, the electron orbitsphere is a "dynamic spherical resonator cavity" that traps photons of discrete frequencies. Broader implications of GUT-CQM include the possibility of catalytically shrinking the hydrogen atom to below "ground state, releasing useful energy in the process. Unification of the electron orbitsphere radius formula with General Relativity (GR) provides a quantum explanation for gravity as well. This leads to a novel explanation for the recently observed accelerating expansion of the cosmos.

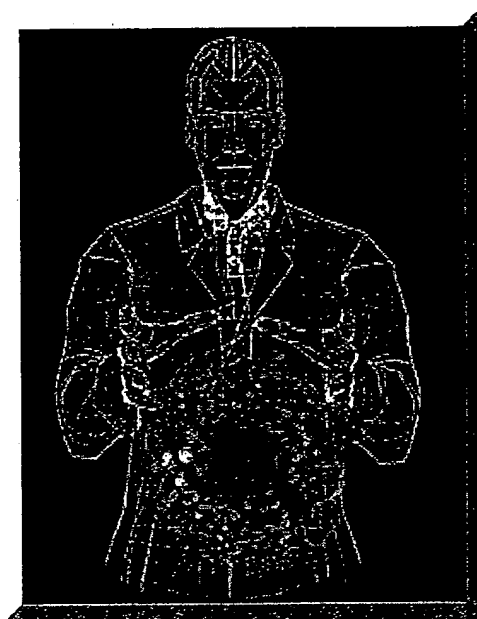
- ▶ To learn more about this radical new theory and its experiments and validations, visit the [BlackLight Power](#) home page. Pay close attention to the *free* book you may download from there! Note the many lab reports available there as well.
- ▶ To read many arguments for and against this theory, check out the message archives of the Hydrino Study Group [e-mail list](#), established in March 2000.



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"The person who says it cannot be done should not interrupt the person doing it."

--Chinese Proverb

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Disclaimer: The author of this page is neither an employee nor an investor in Dr. Randell Mills' company, BlackLight Power Inc. His interest in Dr. Mills' work is strictly intellectual.

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